A STUDY OF CONSULTANCY REPORTS' CONCLUSIONS ON REOPENING PLYMOUTH CITY AIRPORT FOR COMMERCIAL PASSENGER SERVICES

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Contents

Executive Summary

Purpose

1. The purpose of this study is to assess whether previous reports have identified whether there are viable options for the reopening of Plymouth City Airport (PCA) for commercial passenger services. Evidence is drawn from the existing literature base and has not been supplemented with additional primary analysis. Where there have been technical queries – for instance with regard to airport operation and infrastructure – further clarification has been sought from the Civil Aviation Authority (CAA).

2. The Department for Transport ('the department') has assessed previous reports' conclusions on viability through two main channels – the extent to which supply constraints prevent commercial passenger services from being operated at PCA, and the level of demand for commercial passenger services. The reports' observations on future changes in the aviation market are also presented. Finally, the study discusses the reports' conclusions on the implications of the aforementioned factors on the commercial viability of a reopened PCA.

Supply constraints at Plymouth City Airport

3. PCA's relatively short runway is consistently noted by studies to be the primary supply constraint faced by the airport. The runway's declared distances are further influenced by the requirement for an extension to the length of at least one of the Runway End Safety Areas (RESAs) and the surrounding commercial and residential plots rendering any extension beyond 1,199m as not viable. These runway constraints ultimately mean that the runway is limited to operating with 50 seat turboprop aircraft, with several reports suggesting even these aircraft types may be range or payload restricted.

4. None of the reports reviewed suggest that the required installation, replacement and renewal of infrastructure required to operate commercial passenger services at PCA is an insurmountable supply constraint at PCA. Regardless, the costs associated with doing so would contribute to the capital expenditure required to resume commercial passenger services at the airport.

5. Constraints posed by noise regulation are also considered by a number of the reports. Given the conclusions in some reports that it is unlikely that any future operation at PCA will involve turboprops exceeding 50 seats, the literature reviewed does not suggest that noise constraints will prevent commercial operations from resuming at PCA.

6. Several of the reviewed reports consider a Plymouth to London route as an essential component of a viable PCA. However, some dismiss the possibility of a domestic route to Gatwick or Heathrow, due to constraints on slot capacity at those airports. The

reports generally consider other London airports as being too peripheral given Plymouth's proximity to London, and thus also not suitable for a Plymouth to London route. The only airport proposed as possibly offering a viable route, at least in the short term, is London City due to its central location and onward European connections. However, other reports note aspects which would reduce the viability of a London City route, such as high airport charges and a lack of onward long haul connections.

Demand for commercial air passenger services

7. The former PCA was one of a number of airports serving the South West of England, including Bristol, Exeter and Newquay. Studies note Bristol's strong growth in passenger numbers over the past decade, in contrast to PCA, which did not experience the same level of passenger growth.

8. A number of the reports reviewed in this study have undertaken quantified forecasting of potential passenger demand from a reopened PCA. These find broadly consistent estimates of passenger numbers of around 100,000 per year in the short term, rising to previous peaks of over 150,000 in the longer term.

Future changes in the aviation market and other relevant factors

9. Two of the reports assessed provide a discussion on the future of the aviation market, and how this could affect the viability of commercial passenger services at a reopened PCA. Whilst not linked to short term viability, PCA's runway constraints mean that any future operator will find difficulties in adapting supply in response to market developments. Therefore, it is important to consider whether there is a strong risk that PCA may not be able to offer viable commercial passenger services in the future aviation market.

Potential commercial viability of a reopened Plymouth City Airport

10. None of the reviewed reports suggest that extending the runway beyond 1,199m is a financially viable option due to the capital expenditure required. The literature generally suggests that the terminal passenger demand forecasts would, at least in the short term, not cover operating costs, and PCA's financial viability would largely depend on other forms of revenue generation returning to PCA, alongside commercial passenger services.

11. Four of the reports assessed discuss the potential for existing airlines to resume commercial passenger services at PCA.[1] These reports find that many potential airlines operate aircraft that exceed the runway's capability, or else do not have a focus on expanding domestic routes at smaller regional airports. One interested party, FlyPlymouth, believes that sufficient demand does exist to provide a profitable service in the fourth year of commercial passenger services, and that PCA has the potential to

[1] SHH's technical report, SHH's review of the case for safeguarding, Appendix C of PCC's September 2014 report, and PCC's commercial options report.

meet this demand. However, their business case assumes an initial government loan (*"or an alternative"*) of £4 million and a government subsidy in the form of start-up funding from the Regional Air Connectivity Fund (RACF), of £5 million over the first three years of commercial passenger services.

Overview of reports' findings

12. There is no clear and consistent evidence across the reports to suggest that sufficient demand exists to operate commercially viable passenger services from a reopened PCA. The reports find passenger estimates to be equivalent to or lower than the levels seen prior to PCA's closure, when the airport frequently failed to make profit.

13. PCA is subject to significant supply constraints, namely a relatively short runway that limits the range of aircraft and airlines able to operate from the airport. This in turn limits the number of possible destinations served, restricting demand.

14. The reports show a number of commercial risks which would limit the viability of the airport. Therefore, when reviewing any business case which considers resuming commercial passenger services at PCA, the extent to which the proposal provides sufficient evidence that the effects of these risks can be mitigated should be considered. It is not within the scope of this study to determine whether any existing business cases achieve this.

15. This study's conclusions are based only on the findings of the existing reports. Decisions about whether or not to reopen PCA for aviation purposes are ultimately ones for private business investors to make, and will be dependent on the viability of specific business plans.

1. Introduction

1.1 Scope

1.1 This Department for Transport ('the department') study has been undertaken in response to the government commitment in Budget 2015 to *"undertake a study into whether there are viable options for the reopening of Plymouth Airport."*

1.2 This study brings together, and reviews in detail, the findings from nine previous reports commissioned by interested parties on the potential viability of renewed commercial passenger services from the former Plymouth City Airport (PCA), which closed in December 2011. It provides a summary of the previous reports' consideration of the issues influencing the airport's commercial viability, including supply side considerations which look at what service the previous airport site could feasibly provide, and the level of demand for commercial passenger services from PCA. It also sets out the broader policy and commercial considerations that external stakeholders might find helpful in reaching decisions on PCA's future as a commercial services passenger airport.

1.3 The department does not give greater or lesser weight to any particular reports reviewed in the study, on the basis that the aim of the study is to provide an overview of all of the reports' conclusions, not to critique their methodologies.

1.4 When looking at supply side factors, this study considers the reports' conclusions on:

- the technical, operational and regulatory constraints, relating to noise and other requirements set by the independent regulator, the Civil Aviation Authority (CAA) of reopening the airport site;
- the potential for re-establishing a Plymouth to London route, and how this has changed since 2011; and
- the likelihood of investment from potential airport operators and airlines.

1.5 When looking at demand side factors, this study considers the reports' conclusions on:

- historic and potential passenger demand for the airport, and by extension aircraft load factors, in the context of nearby airports and the wider domestic air market; and
- competition from and demand for other airports covering the South West region (mainly Bristol, Exeter and Newquay).

1.6 In bringing together demand and supply side factors, this study considers how reports assess the commercial viability of options for reopening PCA with commercial passenger services against:

- initial capital expenditure required to reopen PCA under each option;
- profits and losses incurred under each option; and
- the likelihood of specific airlines resuming commercial passenger services at PCA.

1.7 This study does not:

- consider the reports' conclusions on:
  - the impact of developing the site for non-aviation purposes;
  - the direct and indirect economic benefits of having an airport in Plymouth;
  - regulatory requirements beyond those required by the CAA, as set out in Civil Aviation Publications (CAP), and to comply with noise regulation; or
  - the commercial viability of resuming forms of aviation at PCA other than scheduled commercial passenger services. Therefore, General Aviation activities are only considered where they are explicitly presented in the reports as a means of concurrently supporting scheduled commercial passenger services through the additional revenue stream they could provide.
- provide a critique of analysis used in each report;
- analyse data that is not used in each report;
- assess the commercial viability of any business case regarding the future of the PCA site;
- consider the likelihood of a reopened PCA, or the services which could operate at the airport, receiving a government loan or subsidy in the form of a Public Service Obligation or start-up funding; or
- discuss options for reopening PCA for commercial passenger services that have not been presented in the reports reviewed.

1.8 The study makes references to factual information provided by the CAA only as a means to provide clarification. For example, on airport runway management systems, operational procedures, physical characteristics, assessment and treatment of obstacles, and visual aids.

1.9 The department has not engaged directly with the consultants who produced the earlier reports that this study assesses. The department has only engaged with the interested parties for whom the reports were produced to obtain their consent for the reports to be included within the study, and to clarify whether any information in the reports is, or may be, commercially sensitive.

1.10 The interested parties have checked the study and have provided factual corrections and detailed comments. A summary of interested parties' comments, and the department's consideration of them, is included in Annex C.

1.11 The department's study does not set out information from earlier reports that the interested parties have indicated is, or may be, commercially sensitive.

1.2 Government policy

1.12 The Government's Aviation Policy Framework, published in March 2013, supported the growth of airports across the United Kingdom, and confirmed that these airports play an important role in securing connectivity for local populations, and are vital to their local economy. The Aviation Policy Framework affirmed the Government's support for competition as an effective way to meet the interests of air passengers and other users, and welcomed the continued significant levels of private sector investment in airport infrastructure across the country and the establishment of new routes to developed and emerging markets.

1.13 The UK aviation industry therefore operates essentially without subsidy, and all key players – airport operators and airlines – are either in the private sector or operate on a commercial basis. The Government considers that the UK's airports, and the airlines which operate services from them, working together in such a commercial environment are best placed to determine the air routes that operate to and from, and within, the UK. Because of this, the UK Government has limited influence over the sector's operation and governance, other than setting the regulatory framework, which is implemented by the CAA, an independent regulator with responsibility for economic, safety and consumer protection regulation.

1.14 In this context, future commercial decisions regarding PCA will be private matters for its owner, leaseholder, and other interested commercial parties.

1.3 Historic context

1.15 Plymouth (Roborough) Airport officially opened in 1931 as a civilian grass aerodrome under the ownership of the City Corporation. Requisitioned by the Admiralty during World War Two, the aerodrome was later transferred to the Air Ministry as RAF Roborough and was used by RAF Fighter Command and Coastal Command units.

1.16 In 1946 the site reverted to use as a civil airport, with a number of small airlines operating domestic services including to the Channel Islands and Isles of Scilly. From 1960 the Royal Navy also used the airport for training operations by the Britannia Royal Naval College Air Experience Flight.

1.17 In 1972 Brymon Airways commenced operations from the airport, initially operating a network of services across the West of England. Brymon took over running of the airport in 1975 and laid down the first tarmac runway (referred to as 13/31) in expectation of an increase in services using larger turboprop aircraft. The second runway (referred to as 06/24) was completed in 1980.[2]

[2] An airport's runway is generally referred to using two numbers between 01 and 36, which indicate the runway's bi-directional alignment based on 1/10 of its bearings from Magnetic North. Thus, the former Plymouth City Airport's "runway 13/31" indicates an alignment of 130 degrees in the WNW-ESE direction, and 310 degrees in the reciprocal ESE-WNW direction.

1.18 Brymon expanded its operations from PCA through the 1980s, including services to Heathrow and Gatwick, and enhanced the airport's facilities. Brymon merged with Birmingham European Airways in 1992 to form Brymon European Airways, which in turn was subsequently bought by British Airways (BA) in 1993, though the `Brymon' name continued in use. However, by the early to mid-1990s higher airport charges were affecting BA's London services, which were subsequently scaled down and later withdrawn.

1.19 Following the withdrawal of the London services, the lease for PCA was sold to Sutton Harbour Holdings (SHH) in 2000 by the airport's freehold owner Plymouth City Council (PCC). This was initially awarded for 5 years, but was extended to 150 years in 2004. British Airways continued to operate at PCA until 2003.

1.20 Thereafter, SHH operated the Air Southwest airline which was based at PCA, and provided both domestic and limited short haul routes. These included, but were not limited to, Gatwick (through a London to Plymouth to Newquay triangle), Manchester, Newcastle, Jersey, Guernsey, Glasgow, Bristol (as a stopping point on some northbound domestic services), Cork, Dublin and ski points in France. A route to London City was also operated from April 2009 to May 2010.

1.21 In September 2010 Air Southwest was sold to Eastern Airways, following PCA's operating loss of £765,000 in 2009.

1.22 The lease for the PCA site included a "non-viability clause", which allowed SHH to serve a notice of non-viability on PCC in the event that SHH believed that the airport to be no longer commercially viable. This was served by SHH in December 2010.

1.23 Attributing falling passenger numbers and high landing fees, Eastern Airways ended the Gatwick route in January 2011. PCC accepted SHH's notice of non-viability in August 2011, following three independent reports assessing the validity of the notice of non-viability.[3] Eastern Airways consequently terminated their remaining Plymouth flights. PCA closed on 23rd December 2011. Air traffic facilities and rescue and fire-fighting cover were subsequently withdrawn. PCC has safeguarded the site until 2021 under PCC's Local Development Framework Core Strategy.

1.24 Since the closure of PCA, numerous reports have been published by interested parties, relating to the viability of a reopened PCA and the future of the former airport site. SHH have proposed redeveloping the former airport site into residential and commercial buildings. However, PCC remained *"supportive of achieving a viable commercial airport if this is possible"* and announced five tests which any potential operator would need to meet for *"viable commercial operation"*:

[3] PCC's commercial options report, PCC's economic report, and PCC's due diligence report. The latter has not been included within the scope of this study. Annex A provides a comprehensive summary of reports submitted for this study.

- to acquire ownership of the airport and its associated infrastructure;
- to operate commercially i.e. without a public subsidy;
- to demonstrate an ongoing commitment to air services;
- to have a robust fully funded business plan; and
- to clearly evidence demand and provision of Plymouth air services.[4]

1.25 Viable, a consortium of local business representatives and interested parties who believe that the airport has a commercial future, established a campaign to reopen PCA, presenting a 37,000-signature petition to PCC in August 2012. In May 2015 Viable's campaign ended and the group evolved into FlyPlymouth, a social enterprise which aspires to reopen the airport on a short operating lease, initially for fixed based operators, MoD-related operations, Search and Rescue, police, charter and air taxi operations, and General Aviation. Thereafter, FlyPlymouth's business plan involves creating a new airline to operate domestic routes from PCA to destinations within the UK and Ireland.

1.26 In 2015 FlyPlymouth launched a crowdfunding appeal to raise initial funds to engage professional aviation experts and advisers to validate the business plan so that it could be presented to potential stakeholders and funders.

1.27 Figures 1.1 and 1.2 provide further context on PCA's location relative to other airports serving the South West regions, and the extent to which further runway expansion may be restricted by surrounding residential and commercial plots.

[4] http://www.plymouth.gov.uk/abouttheairport (retrieved 19/07/2016)

Figure 1.1 PCA's location relative to other South West airports

Figure 1.2 Aerial photograph of the former Plymouth City Airport

Source: Google Maps, retrieved 14/07/2016.

1.4 Reports

1.28 The department has been asked to review a number of reports previously commissioned by the key stakeholders with an interest in the former airport site. These are:

- PCC, the freeholder of the former airport site;
- SHH, the current leaseholder of the former airport site; and
- FlyPlymouth (formerly known as Viable), a social enterprise which aspires to reopen PCA.

1.29 The department undertook an exercise to determine whether or not the earlier reports would be within the scope of this study. A summary of each of these reports is provided in Annex A, including explanations for why they have been ruled in or out of scope. Table 1.1 below summarises the reports considered within the scope of this literature review.

1.30 The study compares and contrasts the findings of various reports as presented by their authors. The quality of analysis and facts used in the reports reviewed have not been critically assessed or quality assured by the department, and the reliability of each report is therefore not known. The use of any report in the study does not indicate endorsement by the department.

Table 1.1: Reports in scope of the department's study

Report	Date Published	Author	Commissioner	Title used in reports
Plymouth City Airport Runway Length Requirements	November2007	Mott Macdonald	PCC	PCC's runway report
Economic Study into Air Services for Plymouth	August 2011	Berkeley Hanover Consulting Ltd	PCC	PCC's economic report
Commercial Options for Plymouth City Airport	August 2011	Oriens Advisors Ltd	PCC	PCC's commercial options report
An Economic Impact Assessment of Plymouth City Airport	February 2014	York Aviation	Viable	Viable's economic impact report
Former Plymouth City Airport Site: Independent Aviation Study – Technical Evidence	March 2014	Fjøri Ltd	SHH	SHH's technical report
Former Plymouth Airport Site- Airport Re-opening Feasibility Noise Issues	March 2014	Bickerdike Allen Partners	SHH	SHH's noise report
Plymouth Airport Study: Final Report	September 2014	Ove Arup and Partners Ltd	PCC	PCC's September 2014 report

A review of the Case for the Safeguarding of the Former Plymouth Airport Site for Future Aviation Uses	December 2015	Bickerdike Allen Partners, Steer Davies Gleave Ltd and Fjøri Ltd	SHH	SHH's review of the case for safeguarding
FlyPlymouth Confidential Business Plan	March 2016	FlyPlymouth	FlyPlymouth	FlyPlymouth's business plan

2. Supply constraints at Plymouth City Airport

2.1 Where there is viable demand for commercial passenger services at an airport, the airport must have means to ensure that this level of demand can be catered for. However, the extent to which demand for commercial passenger services at an airport can be met is largely restricted by the following factors:

- runway constraints;
- other licensing and infrastructure requirements;
- airspace; and
- the availability of sufficient capacity at destination airports, including landing slots.[5]

2.2 Each report considers the physical, financial and licensing constraints of resuming commercial passenger services at PCA to some extent in their analysis. In particular, PCC's runway report, Appendix B of PCC's September 2014 report, and SHH's technical report examine a range of runway options which take account of these constraints. They also consider the subsequent impact this would have on the capability of the runway to support various aircraft, and hence the ability for airlines to provide (supply) adequate commercial passenger services.

2.3 Several of the reports make assumptions regarding the availability of landing slots at desirable London airports. A route to London is particularly pertinent to discussions on the ability of airlines to resume services at PCA, as the former Gatwick route is often alluded to in reports as being the most, or only, profitable route. Appendix C of PCC's September 2014 report and SHH's technical report discuss in greater detail the likelihood of available and affordable landing slots at desirable London airports. FlyPlymouth's business plan includes a discussion on potentially viable routes.

2.4 Supply constraints at PCA are considered under the following sections:

- **Section 2.1** investigates how the reports acknowledge licensing constraints that would restrict the size and strength of the runway. The section then compares options for changes to the runway considered by each report, and the perceived impact this would have on runway capability.
- **Section 2.2** discusses each reports' investigations into any further infrastructure and licensing requirements, which do not directly affect runway capability, but would still require capital investment.
- **Section 2.3** provides a brief overview of reclaiming airspace, which is discussed in SHH's technical report.

[5] Landing slots are only applicable at co-ordinated airports where capacity is shown to be insufficient to meet all actual or planned airline operations. In the UK these are London Heathrow, London Gatwick, London Stansted, London City, London Luton, Manchester, and (from summer 2017) Birmingham.

- **Section 2.4** assesses how each report perceives the likelihood of available and affordable landing at desirable destination airports and hence whether these routes are viable, specifically with regards to London airports.

2.1 Runway constraints

2.1.1 Licensing Framework

2.5 In PCC's September 2014 report and SHH's technical report, Fjøri and Arup each received written confirmation from the CAA confirming that a new aerodrome licence would be required for fixed wing public transport to recommence at a reopened PCA, and that any historic variances or dispensations, which are common and often used where there are geographic limitations, would not automatically be reapplied.[6]

2.6 This allows the reports to assess aerodrome licensing requirements against CAP 168, which is explicitly undertaken by Mott Macdonald in PCC's runway report, Berkeley Hanover in PCC's economic report, Fjøri in SHH's technical report, SHH's review of the case for safeguarding, and Arup in PCC's September 2014 report and its appended reports.[7] The removal of historical dispensations at PCA most pertinently affects RESA requirements, which are further discussed in Section 2.1.3.

2.7 In SHH's technical report, Fjøri further acknowledge forthcoming regulations *("expected to come into force in 2014"* at the time of publication) by the European Aviation Safety Agency (EASA), as a reopened PCA would be within its remit.

2.8 However, Fjøri note that it is not expected that EASA's certification specifications will deviate appreciably from CAP 168 criteria, as they are both interpretations of compliance set out in International Civil Aviation Organisation (ICAO) Annex 14.[8] In SHH's review on the case for safeguarding, the authors further reiterate this argument, specifying that EASA will not change key requirements for declared distances and runway strip width, as the measure for the runway code definition will remain as it was in CAP 168.

2.1.2 Runway Size

2.9 When referring to the length of the runway, the reports discuss four types of declared distances: Take-Off Run Available (TORA), Take-Off Distance Available

[6] CAA letter to PCC dated 27/08/2014 is provided in the appendices of PCC's September 2014 report and CAA letter to Fjøri dated 20/02/2013 is provided in the appendices of SHH's review of the case for safeguarding.
[7] The CAA's Civil Aviation Publication (CAP) 168 sets out the standards required at UK licensed aerodromes relating to its management systems, operational procedures, physical characteristics, assessment and treatment of obstacles, visual aids, rescue and fire-fighting services and medical services. [http://publicapps.caa.co.uk/docs/33/CAP%20168%20Licensing%20of%20Aerodromes.pdf] (retrieved 18/07/2016)
[8] http://www.icao.int/safety/AirNavigation/NationalityMarks/annexes_booklet_en.pdf (retrieved 18/07/2016)

(TODA), Accelerate Stop Distance Available (ASDA) and Landing Distance Available (LDA). The definition for these and the declared distances for the airport's remaining operational runway 13/31 are described in table 2.1. For clarity, "runway 13" refers to the runway direction from west to east, and "runway 31" refers to the reciprocal east-west direction.

Table 2.1 Former Declared Distances at Plymouth Airport

	Definition	Runway 13	Runway 31
TORA	Length of runway available for aircraft to take-off	1,108m	1,101m
ASDA	TORA + length of stopway	1,108m	1,101m
TODA	TORA + length of clearway	1,169m	1,169m
LDA	Length of runway available for aircraft to land	1,025m	1,040m

Source: CAA

2.10 The former South-West/North-East runway 06/24 was closed in August 2009, following the sale of part of the 06 end of the runway in 2008, which means it is no longer suitable for commercial passenger services. The remaining section of the closed runway subsequently acted as a taxiway (Charlie) between the apron and the operational runway 13/31.

2.11 When discussing licence requirements in relation to runway length, the reports often refer to the runway's reference code. The elements of the code are summarised in Table 2.2. The code number refers to the maximum TODA/ASDA available and the code letter refers to the wing span or outer main gear wheel span, depending on which is the most demanding, of the largest aircraft used. With a TODA of 1,169m, PCA had a code 2C non-precision instrument runway at the time of closure.

Table 2.2 Aerodrome Reference Code

Code element one		Code element two		
Code Number	The greater of TODA or ASDA	Code letter	Wing span	Outer main gear wheel span
1	Less than 800m	A	Up to but not including 15m	Up to but not including 4.5m
2	800m up to but not including 1,200m	B	15m up to but not including 24m	4.5m up to but not including 6m
3	1,200m up to but not including 1,800m	C	24m up to but not including 36m	6m up to but not including 9m
4	1,800m and over	D	36m up to but not including 52m	9m up to but not including 14m
		E	52m up to but not including 65m	9m up to but not including 14m
		F	65m up to but not including 80m	14m up to but not including 16m

Source: CAP 168, Table 3.1, p.85

2.1.3 Runway End Safety Area (RESA)

2.12 A RESA is an area beyond the end of a runway, designed to minimise damage to an aeroplane which overruns or undershoots on a runway. CAP 168 states that these are compulsory for Code 1 and Code 2 instrument runways and all Code 3 and Code 4 runways. The minimum requirement for the length of a RESA is 90m, though the CAA recommend that RESAs should extend to at least 240m for Code 3 and Code 4 runways and 120m for Code 1 and Code 2 instrument runways. The minimum required RESA width is twice that of the runway width.

2.13 Each of the reports discussing runway constraints at PCA address the CAA requirement that RESAs for a Code 2 instrument runway should be at least 90m in length and twice the width of the runway. Therefore, with a runway width of 30m, the RESAs at PCA would require minimum dimensions of 90x60m. Before PCA closed, the RESAs on runway 31 and runway 13 were 90x90m and 30x90m respectively.

2.14 Whilst the short RESA at runway 13 was considered satisfactory prior to closure, Fjøri (in SHH's technical report), Arup (in PCC's September 2014 report) and York Aviation (in Viable's economic impact report) accept that a RESA length of at least 90m will be necessary should the airport be reopened. Indeed, Fjøri state that they have received confirmation from CAA that this will be the case and note that the CAA had begun discussions with PCA before its closure, seeking to rectify this irregularity.

2.15 Despite confirmation from the CAA to the contrary, one solution proposed by FlyPlymouth in their business plan is to request a CAA risk-based approval of the existing runway configuration. The second solution proposed is to extend the RESA on runway 13 and revise the declared distances appropriately. The other two options regard using EASA-compliant engineered material arresting systems (EMAS) and relocating the airfield boundary fence a short distance to the east. However, the merits of each of these options are not discussed by FlyPlymouth, nor is a preferred option stated.

2.16 Fjøri consider the possibility of using EMAS as an alternative to meeting preferred RESA lengths. Though, according to Fjøri, amendments to CAA policy towards EMAS had not been finalised at the time the report was written, Fjøri conclude that it is unlikely that EMAS will be of relevance to PCA as existing policy suggests that EMAS can only be used as an alternative to meeting preferred RESA lengths of 240m for code 3 and code 4 runways. [9]

2.17 The department have since contacted CAA to seek clarification on the use of EMAS on code 2 runways. Referencing FAA Advisory Circular (AC) 150/5220-22 (EMAS), the response states that whilst there is no technical requirement for the length of the runway, EMAS may not necessarily be useful for smaller aircraft, as previous EMAS

[9] Fjøri base these conclusions on the CAA's proposed amendment, CAA Notice 01/2013

research work has been based on the premise that the aircraft using the system has a maximum take-off weight of over 25,000lbs and that the modelling is not as accurate for aircraft weighing less than 25,000 lbs at maximum take-off weight.

2.18 Fjøri and Arup also discuss the CAA recommended RESA lengths of 120m for code 2 instrument runways. Whilst Arup do not discuss this further, aside from acknowledging that declared distances may need to be reduced or mitigation measures implemented, Fjøri conclude that it is likely that CAA will stipulate that 120m length RESAs should be used on both ends of the runway at PCA and incorporate this into their analysis.

2.19 PCC's runway report was published in 2007, prior to PCA's closure when the RESA dispensation was still in place. Nevertheless, when assessing potential runway options, Mott Macdonald acknowledge that the RESAs would need to be adjusted to either the CAA minimum required dimensions of 90x60m or the recommended dimension of 120x60m if the runway were to be extended and maintain its Code 2 status.

2.20 Following the notice of non-viability activated by SHH, Berkeley Hanover also recognise that the CAA might wish to *"terminate any current derogations"* in the event of a change of ownership. Berkeley Hanover suggest that the CAA may subsequently require the lengthening of the RESAs from 90m to 240m according to their *"relatively recent requirement"*. However, as other reports allude, 240m is only the recommended RESA length for a Code 3 or Code 4 runway.

2.1.4 Instrument and non-instrument runways

2.21 Table 2.3 shows that one of the key differences in licensing requirements for instrument and non-instrument runways is the minimum width of the runway strip. Mott Macdonald, Fjøri (in SHH's technical report), Berkeley Hanover and Arup confirm that Runway 31 was served by a Category (CAT) I Instrument Landing System (ILS) at the time of closure.

Table 2.3 CAA minimum runway strip width requirements (from each side of the centreline)

Code Element 1	Instrument Runway	Non-Instrument Runway
1	75	30
2	75	40
3	150	75
4	150	75

Source: CAP 168, p.93

2.22 In SHH's technical report and Appendix B of PCC's September 2014 report, Fjøri and Arup discuss the licensing requirements for instrument and non-instrument runways and the implications of this for the viability of resuming commercial passenger services at PCA.

2.23 Both reports agree that a Code 3 instrument runway would not be viable due to the prohibitively expensive compulsory purchase of land currently used for residential and commercial purposes, which would result from extending the runway strip width to 150m either side of the centreline. Therefore, they do not consider any options whereby the runway strip would need to be extended beyond the current width of 75m either side of the centreline.

2.24 To bypass this, Arup consider a runway option which involves reclassifying the runway as Code 3 non-instrument with an extended TODA of 1,602m. In the main report, Arup subsequently include this in their assessment matrix of airport options, though they acknowledge that a non-instrument runway would mean that flights would have to be diverted to an alternative airport in the event of adverse weather conditions.

2.25 Fjøri, on the other hand, dismiss the use of a Code 3 non-instrument runway at PCA. This is on the basis that, whilst a Code 3 runway would be built to accommodate larger commercial aircraft, an instrument runway would, according to Fjøri, be imperative for credible commercial operations. Fjøri further consider the use of a Code 2 non-instrument runway, which would not require 90m length RESAs. However, Fjøri state that commercial flight opportunities would necessitate an instrument runway, and this option would therefore only be suitable at an early stage in any new operator's business plan period.

2.26 FlyPlymouth's business case does not discuss the possibility of using a non-instrument runway to circumvent width requirements for Code 3 runways. Regardless, FlyPlymouth state that they do not have immediate plans to extend the runway but, subject to demand, the runway may be extended to 1,199m to accommodate larger aircraft. As such, a Code 2 runway is considered *"adequate"* by FlyPlymouth.

2.1.5 10% Dispensation

2.27 Historically, a number of Code 2 runways have been permitted a 10% enhancement on declared distances, whereby the maximum TODA or ASDA, depending which is greater, can be extended to 1,319m without the runway meeting Code 3 runway standards i.e. the minimum runway strip width requirement of 150m either side of the centreline.

2.28 Three of the reports reviewed consider the possibility of extending the runway to 1,319m. Fjøri (in SHH's technical report) and Arup (in PCC's September 2014 report) individually received confirmation from the CAA that the 10% dispensation has since been rescinded and can no longer be applied to new licence applications. Despite this, in PCC's September 2014 report and its appended infrastructure review (Appendix B), Arup include the 10% dispensation as an option when

assessing PCA's runway capability, though ultimately conclude that it is not a CAA-compliant option.

2.29 In PCC's runway report, Mott Macdonald also highlight that the 10% dispensation was removed in a 2001 amendment to CAP 168, so any changes to the runway resulting in a TODA/ASDA in excess of 1,199m would be classified as a Code 3 runway. However, though claiming it is unlikely that the CAA would now allow this dispensation, Mott Macdonald consider the possibility that the CAA's approach could be *"open to challenge"* due to inconsistencies with other regulations and safe operations currently taking place at Code 2 runways, who implemented the 10% dispensation prior to 2001, most notably London City Airport. Fjøri, however, dispute such comparisons being made with London City Airport, due to PCA's proximity to residential areas. The department has also received clarification from the CAA that most historical inconsistencies with other regulations have been removed and, as a new application, they would expect the aerodrome to be compliant with the relevant EU regulation (EU.139/2014), assuming that the aerodrome would be within its scope.

2.1.6 Runway Strength

2.30 In SHH's technical report, Fjøri explain that if the ACN (Aircraft Classification Number) exceeds that of the PCN (Pavement Classification Number) for each of the aerodrome's runways, taxiway and apron groups, this indicates that the pavement is overloaded, though a 10% overload allowance is usually permitted.[10]

2.31 Fjøri confirm that the former runway at PCA had a classification number of 14 F/A/Y/T, indicating a *"relatively weak flexible pavement on a strong foundation but with asphalt materials that would require a restriction on aircraft tyre pressures to 1.0 MPa."* Fjøri then compare the ACN and tyre pressure of selected aircraft against the existing runway and conclude that *"whilst the runway has sufficient strength to accommodate 50-80 seat turboprop aircraft, the current runway would have insufficient strength to accommodate typical 100 seat regional jet aircraft."*

2.32 Fjøri conclude from their analysis that the runway would need to be strengthened to 26 F/A/X/T, which would require an asphalt overlay of 60mm-75mm depending on frequency of use, and the removal and replacement of the existing wearing course, to better accommodate larger aircraft.

2.33 In PCC's economic report, Berkeley Hanover claim that the strength of the runway at PCA is *"relatively low"*, with a PCN of 14. Though they confirm this is *"sufficient for the current aircraft types"* and that *"airport operators are permitted to accept a limited number of movements by aircraft with a PCN requirement in excess of an airport's stated capability."* This is broadly in-line with Fjøri's comments.

[10] CAP 168 states that ACNs provide a numerical relative load rating of the aircraft on pavements for certain specified sub-grade strengths. PCNs indicate that aircraft with ACNs appropriate to the pavement type and specified sub-grade that are equal to or less than the reported PCN can use the pavement without restriction.

2.34 In PCC's September 2014 report, Arup acknowledge that the runway would need to be strengthened to accommodate 100+ seat aircraft and standard regional jet aircraft.

2.1.7 Precision approach aids

2.35 Precision approach aids include a number of lighting and visual indicator systems that provide guidance information to help a pilot acquire and maintain the correct attitude and height when making a landing approach to an airport runway. This is often achieved through an ILS, which uses radio beams to provide horizontal and vertical guidance for pilots.

2.36 In PCC's runway report and economic report, as well as Fjøri's technical report and Appendix B of PCC's September 2014 report, the authors confirm that Runway 31 was served by a CAT I ILS, which enabled all-weather operability, whilst Runway 13 operated a non-precision approach.

2.37 In SHH's technical report and Appendix J of PCC's September 2014 report, Fjøri and Arup consider whether a reopened PCA should use precision approach aids on the runway. Arup claim that this would be necessary due to the historically low visibility at PCA. Fjøri briefly discuss the possibility that, following CAA approval, the TODA of a non-precision instrument Code 2 runway can be increased to 1,400m, with a minimum requirement for a runway strip width of 105m either side of the centreline, which is 45m less than would be required for a Code 3 runway of this length. However, Fjøri conclude that all weather capability, which would be enabled by precision approach aids such as ILS equipment *"would be an almost essential pre-requisite to attract any new airlines to fly scheduled services"*.

2.38 Several of the reports, including FlyPlymouth's business plan, consider GPS alternatives to ILS equipment. Arup (in Appendix J of PCC's September 2014 report) claim that the CAA and EASA are currently trialling precision approaches using emerging GPS technologies as an alternative to ILS approaches. In PCC's economic report, Berkeley Hanover argue that the use of a European Geostationary Navigation Overlay System (EGNOS) would increase the accuracy of GPS and that it is *"probable that British airports will be licensed to operate with EGNOS within the next five years [by late 2016]."* In SHH's technical report, Fjøri also discuss the development of GPS and EGNOS approaches, though they state that the risks and mitigations of operating these would need to be set out in a Safety Assurance Document, accompanying the new licence.

2.39 The department has received confirmation from the CAA that whilst a reopened PCA would be able to make use of EGNOS, this system is currently limited as a primary approach aid to 200 ft. While his would effectively restrict the runway to a Category II precision approach, this could nonetheless provide an improvement over the Category I ILS in place prior to the airport's closure. EGNOS systems are

also limited to the type of aircraft that are able to use it- primarily those fitted with the latest Garmin systems.

2.1.8 Runway Capability

2.1.8.1 Reports' Approaches

2.40 The reports take varying approaches when assessing the capability of a reopened PCA to provide commercial passenger services. Three of the reports undertake a full assessment of runway options and the fleet that would be able to operate under each option. Due to the nature of their scope, other reports included in this study take a less comprehensive approach, such as providing a general overview on the types of aircraft that could operate at the airport. These approaches are summarised below.

2.41 In PCC's runway report, Mott Macdonald select a range of aircraft types that can *"reasonably be expected to operate commercial passenger services from an enhanced runway at Plymouth."* They then calculate the amount of fuel that could be carried, by deducting 100% and 90% load factors from the take-off weight required under each runway option. The maximum fuel load is used to calculate the potential range of each aircraft under each runway option.

2.42 The report does not discuss the requirement to extend the aerodrome boundary under options involving extensions to the runway's length or width, nor does it clarify the residential and/or commercial plots that would need to be acquired as a result. It should also be noted that this report was published in 2007, three years prior to the notice of non-viability.

Table 2.4 Runway options assessed in PCC's runway report

Option	Declared Distances	Comments
Existing runway	TORA/ASDA =1,100m	This is approximately the existing length. This option is not assessed in detail by the report.
Existing runway with 90m or 120m RESAs	TORA/ASDA =900m to 1,000m	Shorten the existing runway take-off distances to provide 90m (minimum) or 120m (recommended) length RESAs, as required by the CAA. Report anticipates that *"commercial operations by their [Air Southwest's] existing fleet would no longer be possible"*. This option is not assessed in detail by the report.
Extended code 2 runway (CAA compliant)	TORA/TODA/ASDA =1,199m (Adjusted to 1,100m equivalent length to account for 0.95% runway gradient)	This would not require a change in the runway strip width requirements. Report clarifies that there is *"no indication that the CAA will permit the standard adjustments to this length for altitude, gradient and temperature".* This option would include a 90m or 120m length RESAs.
Extended code 2 runway (10% dispensation) OR Code 3 runway	TORA/TODA/ASDA =1,319m (Adjusted to 1,200m equivalent length to account for 0.95% runway gradient)	If the 10% dispensation is accepted and the runway is granted Code 2 status, this would not require a change in the runway strip width requirements. If a code 3 runway is required for this runway length, then the runway strip width would need to be extended to a minimum of 150m either side of the centreline. This option would include a 90m or 120m length RESAs.

2.43 In SHH's technical report, Fjøri calculate whether an 80% or 100% passenger uplift is viable for aircraft sizes varying from 19 to 122 seats on a range of runway options. They also consider the extent to which the range is considered restricted for each of these options. Fjøri do not consider any runway options which involve the width of the runway being extended as they consider the subsequent purchase of roads and residential buildings too prohibitive.

Table 2.5 Runway options assessed in SHH's technical report

Option	Declared Distances (13/31)	Comments
Existing runway	TORA=1,109/1,102m TODA=1,169/1,168m ASDA=1,109/1,102m LDA=1,027/1,045m	This option assesses the capability of the runway before closure. Though this would not satisfy RESA requirements as stated in the report, Fjøri include this option to provide consistency with analysis in the 2008 Plymouth City Airport Masterplan.
Existing runway with 90m RESAs	TORA=1,049/1,102m TODA=1,169/1,168m ASDA=1,049/1,102m LDA=967/985m	As per the CAA minimum requirement for RESA lengths. This would involve extending the length of the RESA on runway 13 by 30m.
Existing runway with 120m RESAs	TORA=1,019/1,072m TODA=1,169/1,168m ASDA=1,019/1,072m LDA=907/925m	As per the CAA's suggested RESA lengths. This would involve extending the length of the RESA on Runway 13 by 60m and on runway 31 by 30m. Fjøri view this as a likely requirement.
Extended code 2 runway (CAA compliant)	TORA=1,160/1,180m TODA=1,199/1,199m ASDA=1,160/1,180m LDA=1,040/1,040m	Extend the runway 13 RESA to 90m length, as per minimum CAA requirements. Extend the runway pavement at the runway 31 threshold by 80m and at the runway 13 threshold by 60m to minimise impact on declared distances. Fjøri claim that this would require land acquisition of one industrial area plot.
Extended code 2 runway (CAA compliant) with 1,319m LDA	LDA=1,319m	This option is not discussed in great depth. It considers the impact of an increased LDA (equivalent to the maximum TODA under a 'balanced field' approach) when the 10% dispensation is applied in exceptional circumstances to a Code 2 runway. The impact of this option on the runway reference code, and hence the required runway strip width, is not explored. The results for this option are the same as that of "*Extended Code 2 runway (CAA compliant)*", and are not discussed further in this study.

2.44 In Appendix B of PCC's September 2014 report, Arup assess the payload, length and range of various aircraft types against three runway options. The size of the aircraft considered range from 20 seats to 189 seats. Larger aircraft are only considered for the more expansive options. These runway options, and the results

of Arup's runway analysis, are incorporated into the airport options assessment undertaken in PCC's September 2014 report.

Table 2.6 Runway options assessed in Appendix B of PCC's September 2014 report

Option	Declared Distances	Comments
Existing runway with 90m RESAs	TODA= 1,167m	This would involve displacing the runway 13 threshold to create a longer starter strip and maximise TODA.
Extended code 2 runway (10% dispensation)	TODA= 1,319m	This option assumes that the CAA will permit PCA to use the now defunct dispensation that a Code 2 runway can be extended to a TODA of 1,319m, without extending the width of the runway strip. This would require land acquisition South East of the existing runway strip.
Code 3 non-instrument runway	TODA=1,602m	This option assumes that the CAA will permit PCA to use the now defunct dispensation that a Code 2 runway can be extended to a TODA of 1,602m, without extending the width of the runway strip. This would require land acquisition South East of the existing runway strip. Arup consider this to be *"the maximum possible runway extension length that can be provided…without necessitating major road diversions and land acquisition of residential development."*

2.45 In PCC's economic report, Berkeley Hanover consider two airport options which involve commercial passenger services: maintaining the airport as it was before closure with 50 seater aircraft, and reopening as a licensed airport with 19 seater scheduled aircraft. As the scope of the report focuses more on the financial implications of these options, rather than technical requirements, Berkley Hanover do not study the capability of each aircraft on the runway in-depth but suggest a range of aircraft which they considered to be permitted on the existing runway when the report was published in 2010.

2.46 In PCC's commercial options report, Oriens identify aircraft which they perceive to be capable of operating at Plymouth's runway, based on *"earlier Mott Macdonald work"*. It is not stated whether aircraft capability is considered against the existing runway at time of closure or a modified runway with 90m RESAs. It has been assumed in this study that the aircraft have been assessed against the existing runway, with no further modifications.

2.47 In Appendix C of PCC's September 2014 report, Aviation Economics list a range of aircraft which they consider to be suited to PCA given its "current runway restriction" of 1,160m. It is not clarified whether this accounts for required RESA adjustments, nor is the potential range of the aircraft stated.

2.48 In Viable's economic impact report, York Aviation list routes which they perceive the runway to be capable of achieving *"allowing for the fact that the initial runway may fall short of what was previously available"* in their demand forecast. York Aviation estimate the shortened runway to have a TORA of 1,025 to 1,100m, which could suggest that they have considered 90m or 120m length RESAs without further extension to be the most likely outcome in the short term. The routes they consider possible on this shortened runway include the furthest UK airports and Paris. York Aviation also summarise the types of aircraft they believe will be *"suitable with the expected distances following the re-licensing by CAA"*.

2.49 In their business plan, FlyPlymouth propose maintaining the runway as it was prior to the airport closing, but meeting RESA compliance through one of the four options discussed earlier in this study. FlyPlymouth suggest that the runway could be extended to 1,199m in the future in order to accommodate larger aircraft, though they clarify that this is not part of their business case.

2.1.8.2 Aircraft considered

2.50 The passenger aircraft types considered under each of the reports that provide a detailed assessment of runway capability are summarised below. The approximate number of seats on each aircraft, according to each report, are shown in brackets. These differ between reports as the number of seats varies according to specified requirements. The Dash 8 Q300 series was previously operated at PCA by Air Southwest.

2.51 Further to those listed, Mott Macdonald consider a range of Short Take-off and Landing types (e.g. Beechcraft King Air and DH Dash 7) but these are ultimately considered *"not suitable"* due to their size, and are not included in their analysis.

Table 2.7: Aircraft types assessed in technical reports

	Mott Macdonald (PCC's runway report)	Fjøri (SHH's technical report)	Arup (PCC's September 2014 report, Appendix B)
Turboprop Airliners	**ATR** 42-500 (42) 72-102 (70) 72-500 (70) **Bombardier** 8 Q200 (19) 8 Q300 (50) 8 Q400 (70) **Saab** 340B (35) 2000 (50)	**ATR** 42-400/500 (48) 72-212A (66) **BAe** Jetstream 31 (19) Jetstream 41 (30) **Bombardier** 8 Q300 (50) 8 Q400 (74) **Fokker** 50 (50) **Saab** 340B (34)	**ATR** 42-500 (48) 72-201 (66) 72-500 (68) **Bombardier** DHC 6-300 (20) DHC 6-400 (20) DHC 8-101 (37) DHC 8-201(37) DHC 8-301 (56) DHC 8-402 (78) **Saab** 340A (30) 2000 (58)
Regional Jet Airliners	**Airbus** A318 (107) **BAe Avro** 146-100-RJ70 (70) 146-200-RJ85 (85) 146-300-RJ100 (110) **Bombardier** CRJ200 (50-70) **Embraer** 170 (70) 175 (80) 190 (105) 195 (115)	**Embraer** 170LR (78) 175LR (88) 195LR (122)	**Airbus** A318-112 (136) A319-131 (156) **BAe Avro** 146-RJ70 (70) 146-RJ85 (100) 146-RJ100 (112) **Boeing** 737-800 (189) **Bombardier** CRJ100 (50) CRJ200 (70) CRJ440LR (70) CRJ700-701 (70) CRJ900 (90) **Embraer** ERJ170 (78) ERJ175 (86) ERJ190 (106) ERJ195 (118)

2.1.8.3 Technical Assumptions

2.52 The technical assumptions Mott Macdonald, Fjøri and Arup make in their analysis are listed below.

Load Factors, Payload and Passenger Uplift

2.53 When measuring the technical ability of an aircraft to operate on a runway, a range of measures can be used to determine the carrying capacity for each aircraft. Whilst precise definitions vary, load factors and payload generally refer to the weight of the passengers, cargo, and baggage relative on aircraft relative to its maximum take-off or landing weight. Passenger uplift refers to the number of passengers on an aircraft relative to the number of seats.

2.54 Mott Macdonald consider the ability for an aircraft to depart with a 100% load factor as an *"important consideration"* and thus should be a primary driver in determining the appropriate length of the runway at PCA. Mott Macdonald indicate that this is partly due to cost-effectiveness and the risk of financial penalty if *"ticket holding passengers are denied boarding for all, but a limited number of permitted reasons."* However, they use a 90% load factor, as well as 100% load factor, in their analysis.

2.55 Fjøri acknowledge that determining a viable passenger uplift is a *"complex issue"* but suggest that 80% is a sensible target for an airline.

2.56 Arup focus on aircraft payload as a measure of viability. They suggest that aircraft with less than 50% payload are *"less viable"*, aircraft with 50%-75% payload can feasibly operate with restricted passenger numbers and aircraft with over 75% payload are *"most suitable for operation"*.

Range

2.57 Whilst Fjøri consider whether each aircraft is range restricted under each runway option, they do not explicitly define this in terms of routes available or nautical miles.

2.58 On the other hand, Arup assess whether each aircraft can operate under each runway option in a 200nm range, which includes all London Airports and reaches as far as Dublin, and a 500nm range, which includes all UK airports and reaches European destinations as far as Geneva.

2.59 Mott Macdonald assess the nautical mile range for each aircraft under each runway option. They measure the nautical mile range of an assortment of domestic and European destinations using 'Great Circle calculations', including a 50nm+5% increase adjustment to derive an approximate flying distance from PCA. Mott Macdonald suggest that an airline operator should at least be able to serve main domestic cities in the UK and Ireland, as well as the main hub airports in Europe (420nm-570nm) and that destinations in the 800nm to 1,000nm range open up other major cities and holiday resorts.

Airfield Elevation

2.60 Fjøri reference the 'originally published' PCA Aeronautical Information Publication (AIP), which assumes an airfield elevation of 472ft (143.9m). Similarly, Arup reference the PCA AIP published in October 2009, which assumes an airfield elevation of 145m (475.7ft). When calculating take-off weights and ranges, Mott Macdonald apply an airfield elevation of approximately 500ft (152.4m).

2.61 The department have since received confirmation from CAA that any future operator at a reopened PCA would need to conduct a survey to determine the required above mean sea level (AMSL).

Temperature

2.62 Fjøri reference the international standard atmosphere (ISA) temperature of 15°C, and suggest that standard procedure is to adopt ISA+10°C. Mott Macdonald adopt both ISA+10°C and ISA+15°C when deriving take-off weights and ranges, though only results for ISA+15°C are published. Arup continue to reference the AIP, and assume the airfield reference temperature is 21°C.

Runway Gradient

2.63 Each report assumes a runway gradient/slope of 0.95%, with Arup explicitly referencing the AIP. Fjøri specify that this is a rise to the North West. Mott Macdonald make explicit adjustments to the declared distances for each runway option to account for the gradient.

Fuel Reserves

2.64 Where known, Fjøri include fuel, reserves required for taxiing and en-route diversions of up to 150nm. Mott Macdonald state in their methodology that they allow *"common reserves wherever possible"*. Arup do not state any assumptions made regarding fuel reserves.

Declared Distances

2.65 Arup assume that the TODA will override the other forms of declared distances when assessing aircraft capability, and thus only consider the impact of the TODA.

2.66 Fjøri do not specify which declared distances they incorporate in their analysis, though it should be noted that they do define each of the four declared distances for all options, except 'Extended code 2 runway (CAA compliant) with 1,319m LDA'. The options involving RESA adjustments on the existing runway have the same TODA but produce different results, suggesting that Fjøri take a different approach to measuring the impact declared distances on runway capability than Arup.

2.67 Mott Macdonald assume that in their analysis that the TORA, TODA and ASDA of each runway option are equal, effectively assuming that there is no stopway or clearway. However, the former runway at PCA included a clearway. Mott Macdonald claim that the take-off weight is the lowest value determined by:

> *"1. ensuring that the aircraft can take-off within the Take-off Run Available (TORA);*
>
> *2. ensuring that the aircraft can take-off and reach the screen height of 35ft above the runway within the Take-off Distance Available (TODA); and*
>
> *3. ensuring that the aircraft can accelerate to a defined speed just short of rotation and abort its take-off, coming to a stop within the Accelerate and Stop Distance Available (ASDA)."*

2.68 Only take-off capability is assessed in Mott Macdonald's analysis, though the report acknowledges that some aircraft may be limited by the LDA on the runway.

Turning Distance

2.69 Fjøri further incorporate the loss of runway length for each aircraft, when performing the required 180° turn at either end of the runway, into their results. It is not stated whether the other reports considered this in their analysis, though Mott Macdonald acknowledge that one of the limitations of an aircraft's take-off weight, other than runway length, could be turning requirements.

Runway Surface Condition

2.70 Fjøri and Mott Macdonald assume that the runway surface is dry. However, Arup assume that the runway is wet from the outset of their analysis. Fjøri conclude that the impact of a wet runway would be that the ATR 42 and 72 would have difficulty landing with a passenger uplift of 80% on the existing runway and that the Bombardier Q400 would have difficulty landing on both the existing runway and the extended CAA compliant runway option.

2.71 Fjøri assume that a new grooved asphalt runway surface would be used, whereas Mott Macdonald assume that a smooth runway surface would be used. Arup do not clarify the type of runway surface assumed.

Wind Condition

2.72 Fjøri and Mott Macdonald have assumed 'zero wind', which Fjøri indicate is the worst case condition for aircraft taking off. Arup do not state any assumption regarding wind condition.

Maximum Passengers

2.73 When calculating maximum number of passengers, Arup assume that each passenger has 0.5 bags, with an average bag weight of 20kg, and that the average weight of a passenger including hand baggage is 80kg. Mott Macdonald make a similar assumption of total passenger weight (including baggage) of 96kg per passenger. It is not stated what assumption Fjøri make when calculating passenger uplift.

Runway Strength

2.74 Though neither report identifies runway strength as being an insurmountable obstacle to runway capability, Fjøri and Arup have both indicated where the aircraft ACN and/or tyre pressure exceeds that of the existing runway strength, and thus runway strengthening or further assessment may be required to facilitate these aircraft. Mott Macdonald do not discuss runway strength.

2.1.8.4 Summary of Findings

Existing Runway

2.75 Fjøri find that the current runway would support the 8 Q300, with an unrestricted range and 100% passenger uplift. However, they conclude that the other 50 seat turboprops assessed, ATR-42-400/500 and Fokker 50, would be range restricted with an 80% passenger uplift. The smallest aircraft considered by Fjøri, the 19 seat Jetstream 31, is also found to be range-restricted on the existing runway. It is also concluded that regional jet aircraft, such as the Embraer 170LR, 175LR and 195LR, ranging from 78 to 122 seats, are not viable with an 80% passenger uplift on the existing runway.

2.76 In PCC's commercial options report, Oriens suggest that the 50 seat turboprop ATR-42 series and the Fokker 50 would be suitable for PCA. However, the overseas route schedule discussed by Oriens is limited to Amsterdam, Paris via Jersey, Germany and Ireland and thus does not necessarily contradict Fjøri's claim that these aircraft types would be range restricted.

2.77 In Appendix C of PCC's September 2014 report, Aviation Economics conclude that operations at the existing runway would be 'limited to 50 seat turboprop aircraft', including the ATR-42 and the Dash-8 300. Aviation Economics also list a further 12 smaller aircraft types which they consider to be suited to PCA, such as the Dornier 328 (30 seats), LET 410 (19 seats) and Islander (9 seats).

2.78 Berkeley Hanover (in PCC's economic report), on the other hand, appear to claim that the existing runway is more restrictive than other reports suggest. Berkeley Hanover only identify 19 seat turboprop aircraft types as having an unrestricted range from PCA. Whilst agreeing with Fjøri's conclusions on the ATR 42 and the Jetstream 31, Berkeley Hanover claim that another 50 seat turboprop previously

used at PCA, the 8 Q300, would not be able to carry passengers much further than Glasgow, whilst its full range should be 800 nautical miles.

Existing Runway with 90m or 120m RESAs

2.79 Extending the RESAs on PCA's runway to a length of 90m or 120m, without extension to the runway strip, is expected to decrease the capability of aircraft to operate on the runway due to the subsequent reduction in declared distances.

2.80 Arup conclude that, if the runway is modified to provide 90m RESAs, then the 50 seat 8 Q300 and smaller turboprops, such as the Dash 8-100/200, would still be able to operate with a payload of 75%-100% in a 500nm radius, indicating that they are *"most suitable for operation on a runway of this length"*. For a 200nm radius, this extends to the 50 seat ATR 42-500 and other smaller turboprops, such as the DHC-6-300/400. In the airport assessment matrix in PCC's September 2014 report, Arup conclude that *"a Code 2 runway, with a displaced threshold to maximise TODA to 1,167m, would support 50 seat turboprop aircraft"*.

2.81 In Viable's economic impact report, York Aviation largely support these findings, with an expectation that 50 seat turboprops such as the 8 Q300, Fokker-50 and ATR-42, as well as smaller turboprops, would be able to operate from a reopened PCA, following changes to the RESAs.

2.82 Fjøri's findings suggest that the 50 seat 8-Q300 and the ATR-42, would be range-restricted on the existing runway with 90m RESAs. Fjøri also find that the 50 seat Fokker 50 would not be viable an 80% passenger uplift. Fjøri discover that the runway becomes further restricted with 120m RESAs, resulting in the 50 seat ATR-42 being considered *"not viable"* with a 100% passenger uplift.

2.83 FlyPlymouth consider five types of aircraft to meet the technical, and commercial, requirements for the runway proposed in their business plan. These are all regional turboprops, ranging from 32 seats to 50 seats: Dornier 328, 8 Q300, ATR 42, Fokker F50 and Saab 340B, though FlyPlymouth state a preference for the ATR 42. Initial routes proposed by FlyPlymouth are to London, Manchester, Edinburgh, Glasgow and Dublin.

2.84 Whilst FlyPlymouth do not directly contradict the analysis by Fjøri and Arup, the results of the analysis suggest some of the turboprops proposed by FlyPlymouth may be payload restricted, or even not viable in the case of the 50 seater Fokker-F50, on the Glasgow and Edinburgh routes (approximately 330nm). Though it should be considered that FlyPlymouth's short term demand forecasts suggest that the average load factor on each of these routes would be below 50%, which would have a further potential range than the more loaded aircraft assumed in other reports' analysis.

2.85 None of the studies suggest that that the existing runway with adjusted RESAs could accommodate regional jet aircraft, with FlyPlymouth stating that the runway is *"long enough for the aircraft types suitable for the local market."*

Extended Code 2 Runway (CAA Compliant)

2.86 Fjøri find that, by extending the runway to the maximum permitted Code 2 runway length of 1,199m, the runway would be able to operate in an unrestricted range with 100% passenger uplift on 50 seat turboprops, such as the ATR-42-400/500, Dash-8 Q300 and Fokker 50. This leads Fjøri to conclude that *"a runway extension would become even more essential if commercial passenger operations would be considered."* However, Fjøri find that larger turboprops, such as the 74 seat 8 Q400, and regional jet aircraft would continue to remain range restricted or non-viable even if the runway were to be extended.

2.87 Mott Macdonald largely agree with Fjøri's findings on the capability of turboprops on a runway extended to 1,199m, concluding that the ATR 42-500 would have a *"substantial potential range"*. However, they do contradict Fjøri's findings on the Dash 8 Q300, suggesting that the aircraft's range would be restricted to 400nm with a 100% passenger uplift. Though Mott MacDonald acknowledge that the range would be improved on warmer days or if the load factor is reduced to 90%.

2.88 Whilst agreeing with Fjøri that the 78 seat Embraer 170LR would not be able to operate due to the landing length available, Mott Macdonald find that the 70 seat BAe Avro RJ70 would be able to serve a *"substantial potential range"*, suggesting that there would be potential for some 70 seat regional jet aircraft to operate on a Code 2 runway if PCA's runway were to be extended to 1,119m.

Extended Code 2 Runway (10% Dispensation)

2.89 Arup find that, by extending the length of the runway to 1,319m, payload and range capability increases. The ATR 42-500 (50 seat turboprop) and BAe Avro RJ70 (70 seat regional jet) would be able to operate with a 75%-100% payload in a 500nm range, Furthermore, the 78 seat DHC 8-402 aircraft would be able to operate with a 75%-100% payload in a 200nm range. In the airport assessment matrix in PCC's September 2014 report, Arup conclude that *"A Code 2C instrument runway with a TODA of 1,319m, using the historical 10% dispensation, would support 50-70 seat aircraft"*.

2.90 Mott Macdonald conclude that extending the runway to 1,319m creates a *"substantial difference to the number of aircraft types that can operate and the range that can be achieved."* However, they find that the viability of Embraer regional jet aircraft and the Dash-8-400 operating on the runway would be dependent on the LDA. This leads Mott Macdonald to conclude that it is vital for the runway to offer a minimum TODA and LDA of 1,319m.

2.91 It should be noted that there is a general consensus amongst the reports reviewed in this study that it is extremely unlikely that the CAA will permit a Code 2 runway which exceeds 1,199m.

Extended Code 3 non-instrument Runway

2.92 Arup find that, by increasing the runway to a TODA of 1,602m, the capability of the runway continues to increase. Various regional jet aircraft, in excess of 100 seats, would be able to operate with 75%-100% payload in a 500nm range, such as the Airbus A318-112, A319-131 and the Embraer ERJ170 and ERJ190. In the airport assessment matrix in PCC's September 2014 report, Arup conclude that *"If strengthened, a Code 3 non-instrument runway with a TODA of 1,602m would support larger aircraft of 100 seat +"*.

2.1.9 Runway Capability - conclusions

2.93 There is consensus amongst the reports that PCA is ultimately restricted in payload, passenger uplift and range by its size, and that this may be further impacted by a reopened runway needing to meet at least the minimum required CAA RESA dimensions. This restriction could be partly relieved by extending the runway length to 1,199m. However, in this case, there is a risk that a number of 50 seat turboprop aircraft types would remain range or payload restricted.

2.2 Other licensing and infrastructure requirements

2.2.1 Condition of existing infrastructure

2.94 In Appendix B of PCC's September 2014 report, Arup describe a site visit to PCA, which they conducted on 11th July 2013, to review the condition and capability of the airport and its facilities. Whilst Fjøri note they did not know the condition of the airport assets at time of writing, they were provided with confirmation from SHH that principal equipment remained in place. Neither of the reports conclude that recommissioning and updating the original infrastructure in and of itself is an insurmountable obstacle to reinstating passenger services at PCA.

2.95 **Terminal**: Both reports address that the operational equipment in the passenger terminal has been removed, along with the interior fit. Arup highlight that the terminal's capacity is limited to one aircraft at a time, but operational improvements at baggage reclaim and an extension to the hold room could enable the building to handle two aircraft at a time.

2.96 **Airfield**: Fjøri received confirmation from SHH that the runway apron, taxiway Charlie, airfield ground lighting, signage and navigation aids remained in place. Arup conclude that the existing airfield infrastructure would be capable of handling passenger services, though some reactive maintenance would initially be required, such as grass cutting and the recalibration and recommissioning of navigational aids.

2.97 **Air Traffic Control (ATC)**: Fjøri received confirmation that the ATC tower remained, along with the relevant ATC equipment, though its condition and suitability is unknown. Arup suggest that it is likely that CAA and NATS will stipulate that the ATC equipment would need to be modernised or upgraded.

2.98 **Rescue and Fire-Fighting Service (RFFS)**: Both reports acknowledge that whilst the RFFS station is still intact, it no longer holds any equipment. Arup also address that the fire training area needs to be repaired to reinstate Category 5 RFFS. However, Fjøri advise that a new RFFS station would also be required as the CAA previously raised concerns regarding the location of the building at the rear of the main apron. Fjøri state, when aircraft were taxiing between aircraft parking and the runway, this location could potentially have compromised response times.

2.99 **Other support services**: Both reports note that the generator and fuel tanks are intact, though they would need to be recommissioned. Arup confirm that the aircraft maintenance hangar is in good condition.

2.100 **Car parking:** Arup highlight that, for security purposes, the CAA may stipulate a 30 metre buffer in front of the terminal building, and thus some car parking spaces would need to be displaced.

2.2.2 Noise

2.101 In SHH's noise report, Bickerdike Allen focus specifically on the feasibility of Viable's proposal to reopen PCA in relation to noise impacts, which Bickerdike Allen set out as listed below:

- Phase 1: *"Re-establish the airport 'initially as an unlicensed aerodrome to facilitate access for FOST [Royal Navy Flag Officer Sea Training], SAR [Search and Rescue] helicopters, the region's Air Ambulances and General Aviation. Following this unlicensed nursery stage the airport will be re-licensed as a Category 2 airport and a new based airline will be established to provide key business routes such as London (Stansted) and Manchester using 19-48 seat aircraft."*
- Phase 2: *"Introduce services to additional UK and near European destinations with 48-72 seat aircraft once an initial short runway extension is complete at the southeast end of the runway."*

- Phase 3: *"A full 279m runway extension at the southeast end of the runway to allow further destinations to be added using 72-125 seat aircraft and around one million passengers per year to be served."*

2.102 The summary of Phase 1, as described by Bickerdike Allen, appears to be similar in nature to FlyPlymouth's business plan. However, as the department has not had access to Viable's original business plan, the accuracy of Bickerdike Allen's interpretation can't be verified. Nevertheless, Bickerdike Allen provide a useful analysis on the noise issues surrounding a potential route to resuming commercial passenger services at PCA.

2.103 One difficulty that presents itself in summarising the conclusions of this study is that Bickerdike Allen assess noise implications of both commercial passenger flights and other forms of aviation. However, the viability of other forms of aviation are not considered to be in scope for this review. Nevertheless, should PCA reopen with commercial passenger flights, it is conceivable that other forms of aviation will operate in conjunction with commercial passenger flights. Therefore, it is considered reasonable to consider aggregated noise impacts when assessing the viability of reopening PCA for commercial passenger flights.

2.104 Bickerdike Allen review the Government's Aviation Policy Framework published in March 2013 and use the following conclusions as the basis for their analysis:

- For daytime flights,
  - A weighted average sound level of 57 dB LAeq,16h from 07:00-23:00 marks the approximate onset of significant community annoyance,
  - A weighted average sound level of 63 dB LAeq,16h from 07:00-23:00 represents moderate levels of annoyance where compensation, such as financial assistance for noise insulation, will need to be provided,
  - A weighted average sound level of 69 dB LAeq,16h from 07:00-23:00 represents high levels of annoyance where the airport operator is expected to assist those affected with the costs of moving.

- For night-time flights[11],
  - Referencing CAP 725, Bickerdike Allen note that Sound Exposure Level (SEL) footprints of 90dB(A) will risk sleep disturbance for those affected.

2.105 Table 2.8 summarises the main findings regarding the impact of noise at a reopened PCA in SHH's noise report, which were based on information from Fjøri on the theoretical level of aircraft activity in each phase and Viable's website on the potential aircraft types in each phase. As well as the three indicators of noise

[11] Before closure, PCA airport was open from 06:30 to 22:30 all year round, FlyPlymouth state in their business plan that this would continue to be the normal daily opening hours of the reopened airport.

nuisance, the population and number of dwellings affected by noise levels of 54 dB or more are included for sensitivity purposes.

Table 2.8 Bickerdike Allen's assessment of the population and number of dwellings affected by airborne noise under each phase of Viable's proposal.

Noise Level		Viable Phase 1	Viable Phase 2	Viable Phase 3
Daytime Flights				
54 dB LAeq,16h	Population	1,900	3,300	9,000
	Dwellings	850	1,250	3,850
57 dB Laeq,16h	Population	700	1,000	5,800
	Dwellings	300	450	2,350
63 dB Laeq,16h	Population	<100	<100	1,000
	Dwellings	<50	<50	450
69 dB Laeq,16h	Population	0	0	100
	Dwellings	0	0	50
Night-time flights				
90 dB (A) SEL Footprint Runway 13	Population	0	100	4,600
	Dwellings	0	50	1,800
90 dB (A) SEL Footprint Runway 31	Population	300	500	8,900
	Dwellings	100	200	3,850

Source: SHH's noise report, p.13-18

2.106 The increase in numbers affected is attributed by Bickerdike Allen to the larger aircraft used as the Viable proposal moves from Phase 1 to Phase 3, notably the introduction of large turboprop aircraft in Phase 3, such as the 70 seater Dash 8-Q400.

2.107 From this analysis, Bickerdike Allen conclude that, by Phase 3, any future airport operator would need to offer:

- financial assistance towards acoustic insulation for residential properties to around 1,000 people in 450 dwellings;
- acoustic insulation to a primary school impacted by noise; and
- assistance with the costs of moving around 100 people in 45 dwellings.

2.108 Bickerdike Allen also point to non-airborne noise that would arise from aircraft taxiing, apron usage and engine testing. Reference is made to previous early morning engine testing and a former ombudsman's recommendation, before PCA originally closed, that compensation should be made to residents in close proximity to the airport affected by this. Bickerdike Allen suggest that the proposed engine testing site, North East of the previous location and south of the terminal, will cause an *"unacceptable noise situation"*. Furthermore, Bickerdike Allen highlight that noisier aircraft types are advocated in Viable's proposal than previously used at PCA. Bickerdike Allen conclude that the existing noise boundary restrictions are *"extremely onerous"* and *"unworkable for a commercial airport"*, and the addition of further restrictions would mean that a future airport operator would be *"hard pressed to meet them"*.

2.109 In SHH's review of the case for safeguarding, the authors provide a follow up to Bickerdike Allen's findings on non-airborne noise. In particular, they refer to BS 4142:2014[12], which is a means of appraising noise emissions from high powered ground running of aircraft engines, and is adopted at Exeter and Norwich airports. According to BS 4142:2014, if the difference between prevailing background noise level and non-airborne noise produced by aircraft (corrected for tonality or intermittency) is greater than around 5dB, then this is likely to indicate an adverse impact. If this difference is greater than around 10dB, then this is likely to indicate a significant adverse impact. The authors conclude that it appears *"extremely likely, particularly when assessed using BS 4142:2014, that an unacceptable situation would occur from engine testing at this location"*.

2.110 Further reference is made to upcoming guidance on the interpretation of the Noise Policy Statement for England (NPSE) as a *"useful insight into how the Government expect the NPSE to be used when assessing a planning matter."* In particular, the authors discuss the:

- Significant observed adverse effect level (SOAEL): where the level of noise exposure is above which significant adverse effects on health and quality of life occur, whereby effects must be avoided or prevented; and
- Lowest observed adverse effect level (LOAEL): where the level of noise exposure is above which adverse effects on health and quality of life occur, whereby effects must be mitigated or reduced to a minimum.

2.111 However, these noise levels have not yet been defined.

2.112 In their business case, FlyPlymouth dispute Bickerdike Allens' findings, criticising that the assessment undertaken uses noise levels under PCA's closed state, rather than its previously opened state, as a baseline. FlyPlymouth also claim that Bickerdike Allen do not find obstacles that are *"insurmountable in re-opening the airport in terms of noise impact"*.

2.113 Other studies reviewed do not discuss noise to the same extent as SHH's noise report and review of the case for safeguarding. However, in SHH's technical report, Fjøri reference SHH's noise report and conclude that noise restrictions could pose a greater constraint than the physical restrictions of PCA. When discussing potential changes for aviation in PCC's September 2014 report, Arup discuss the possibility that future aircraft could be shaped to reduce noise pollution. In Appendix B of the report, Arup acknowledge that the noise implications of an expanded apron would need to be considered in an impact assessment for runway options where airport boundaries are expanded.

[12] BSI Standards Publication: "*Methods for rating and assessing industrial and commercial sound*", 2014

2.2.3 Other licensing and infrastructure requirements- conclusions

2.114 The overall findings of the reports reviewed in this study suggest that PCA is less constrained by *"other licensing and infrastructure requirements"* than runway length requirements. Nevertheless, it should still be noted that, although not insurmountable, these constraints would still contribute to capital expenditure required to resume commercial passenger services at a reopened PCA. Furthermore, it should also be noted that there is not a consensus between the reports on the extent to which noise policy would restrict commercial passenger operations at PCA.

2.3 Airspace

2.115 In SHH's technical report, Fjøri stress that since its licence was revoked following closure, PCA has subsequently lost its Aerodrome Traffic Zone (ATZ). To regain its licence, PCA must provide evidence that they have secured the airspace, which Fjøri suggest is best done by establishing an ATZ. Fjøri claim this could be costly due to significant chargeable work from the Air Navigation Service Provider (ANSP) and the CAA. In addition to the potential modernisation of the ATC equipment, Fjøri received confirmation from the CAA that further costs would be incurred through ATC training and recruiting/retaining staff with a greenfield site exemption.

2.4 Viability of a London route

2.4.1 Potential Routes

2.116 CAA data shows that Air Southwest's busiest route was from Plymouth to London Gatwick, though some services included passengers travelling to Newquay to maximise load factors.[13] Routes to London City and London Heathrow have also previously been operated.

2.117 In Viable's economic impact report, York Aviation acknowledge that there would be *"some limitations on access to major airports with smaller aircraft,"* though this is not taken into account in their market potential assessment.

2.118 Arup, in PCC's September 2014 report, Fjøri, in SHH's technical report, and SHH's review of the case for safeguarding, discuss the viability of a Plymouth to London route. The authors of the latter report argue that this would be the *"cornerstone"* to any reopened PCA, not only for greater links to the capital, but also for international air transfers.

[13] Some services on the London Gatwick to PCA route continued onward to Newquay Airport, with passengers able to embark and disembark at PCA. These data therefore capture some passengers travelling via, but not to, PCA.

2.119 Both Fjøri and Arup conclude that slot constraints at Heathrow and Gatwick would make re-establishing a route from Plymouth to either of these airports difficult. Other London airports are noted to offer fewer long haul connecting opportunities and have less developed surface access links, making them less attractive for onward travel. The conclusions from Fjøri, Arup, Aviation Economics (in Appendix C of PCC's September 2014 report), Berkeley Hanover (in PCC's economic report), and FlyPlymouth's business plan are discussed below, taking each London airport in turn.

2.120 **Heathrow**: Referencing prior research from 2000, Berkeley Hanover conclude that the loss of hubbing opportunities via Heathrow when the Plymouth to London service was moved to Gatwick led to *"bitter commercial disappointment"*, resulting in Plymouth-originating international travellers using surface access to Heathrow, rather than travelling via Gatwick. However, Berkeley Hanover suggest that, without expansion at Heathrow airport, there is no likelihood of a small regional service gaining access to Heathrow.

2.121 Fjøri also highlight the extent to which Heathrow is capacity- and slot-constrained, suggesting that the cost of a slot for the operator of a small commuter style airline would be *"enormous and unjustifiable"*. Furthermore, Fjøri claim it is unlikely that there would be a willing seller of slots, with no carrier at Heathrow having a large minority of slots. In SHH's review of the case for safeguarding, the authors highlight that prime runway slots are especially expensive.

2.122 Arup and Aviation Economics largely support these claims, suggesting that it would be a challenge to establish a new London service at Heathrow due to its capacity constraints and competition for landing slots. However, Fjøri acknowledge that 'slot-sitting' could be used to obtain slots at Heathrow. Fjøri explain that this is the process whereby airlines have more slots than required, and thus pay other airlines to use their slots for a specific period of time to comply with European Commission slot-use rules.

2.123 FlyPlymouth suggest that a hub connection via Heathrow could be an additional opportunity for a reopened PCA, though it does not form part of the business plan.

2.124 **Gatwick**: Fjøri discuss the feasibility of resurrecting the Plymouth to Gatwick route, highlighting the benefit of fast trains running from Gatwick to Victoria Station. Fjøri also explain that, with Gatwick now being easyJet's largest base, it is slot constrained in peak periods, though this is not the case during the majority of the day.

2.125 Arup claim that it is *"unlikely that a Gatwick service would be resumed"* and highlight that, like Heathrow, Gatwick is also capacity constrained. Aviation Economics further explain the reasoning for expensive slots at Gatwick, suggesting that in the last few years Gatwick have increased their summer landing charges and

removed winter landing charges for Chapter 3 and Chapter 4 aircraft.[14] Aviation Economics claim that this means that summer airport charges at Gatwick are prohibitively high for UK regional services, being over £57 per passenger.

2.126 FlyPlymouth suggest that a hub connection via Gatwick could be an additional opportunity for a reopened PCA, though it does not form part of their business plan.

2.127 **London City**: Fjøri discuss a previous Liverpool to London City route and attribute the failure of this route to competition from the Virgin rail west coast service. Fjøri also highlight the benefits of rapid access from London City Airport to the City, the West End and onward European connections. However, Fjøri do not discuss either of these points directly in relation to a Plymouth to London City Airport route. In the review of the case for safeguarding, the authors further claim that London City Airport has amongst the highest airport charges in the UK

2.128 Aviation Economics point to the failed Plymouth to London City route operated by Air Southwest for a few months in 2010, and claim that, along with Luton, Southend and Stansted, there are no attractive long haul connecting opportunities and no fast links to Heathrow, thus restricting the market for Plymouth originating international passengers.

2.129 FlyPlymouth propose a route to London City as part of their business plan.

2.130 **Stansted**: Fjøri dismiss the viability of a Plymouth-Stansted route due to the psychological barrier of passengers travelling to the city centre having to go back on themselves after landing. Fjøri further argue that the onward rail connections from Stansted are better suited to Stansted's target market of low cost carriers, rather than business passengers.

2.131 **Luton**: Fjøri dismiss a Plymouth to Luton route, claiming that poor onward rail connections from Luton would not make this viable.

2.132 **Southend**: Fjøri claim that a Plymouth to Southend route would not be viable due to poor onward rail connections and a lack of connecting aviation routes.

2.133 **RAF Northolt**: Berkeley Hanover discuss the possibility of RAF Northolt airbase reintroducing commercial passenger services in 2015/16, suggesting that this would be preferable to Gatwick in terms of hubbing services (due to its proximity to Heathrow) and access to central London. Similarly, Fjøri highlight that use of the runway at RAF Northolt for small regional services at peak hour slots was proposed as a solution to providing additional aviation capacity in the South East. However, Fjøri consider that it is unlikely that this proposal would be put forward as one of the final options by the Airports Commission as it *"does not provide the*

[14] These refer to ICAO noise standards which increase in stringency as the Chapter number increases [http://www.iata.org/whatwedo/environment/Documents/noise-certification-standards.pdf] (retrieved 18/07/2016)

whole solution and it will only exacerbate the west London air space issue" due to its proximity to Heathrow.[15]

2.4.2 Viability of a London Route - conclusions

2.134 There is general consensus amongst the reports that a route to Heathrow or Gatwick will not be achievable in the short term due to their capacity constraints, and that Stansted, Luton and Southend will not be viable options due to their peripheral locations. Therefore, the overall conclusions of the reports suggest that the only viable route to London, at least in the short term, may be via London City Airport due to its central location and onward European connections. However, other reports suggest that the viability of this route is constrained by high airport charges and a lack of onward long haul connections.

[15]On 25 October 2016 the government confirmed its stated preference for Heathrow Airport Limited's Northwest Runway proposal, which does not include any alterative use of the runway at RAF Northolt

3. Demand for a reopened Plymouth City Airport with commercial passenger flights

3.1 For an airport to operate profitably there must be sufficient demand for commercial passenger flights from that airport. Conceptually, two related components of demand can be considered – firstly, underlying passenger demand for air travel, which directly affects airlines' decisions to operate routes. This then drives the second: airlines' demand for access to airports, which, in combination with cost factors, directly determines the commercial viability of an airport. Assessing whether an airport is commercially viable therefore requires an assessment of potential passenger volumes.

3.2 **Section 3.1** examines how previous studies have considered trends in passenger numbers at PCA prior to its closure, as well as wider trends in demand for air travel originating in the South West. In light of these trends, the reports discuss the potential commercial reasons for PCA's closure, as well as the subsequent effect on connectivity in the South West

3.3 **Section 3.2** summarises the approaches taken in the literature for forecasting potential future demand for commercial services at a reopened PCA.

3.1 Historic demand at Plymouth City Airport and the South West

3.1.1 Trend data

3.4 In Appendix C of PCC's September 2014 report, Aviation Economics undertake an assessment of the competitive positioning of PCA, as well as its potential future viability. Aviation Economics consider in depth the recent trends in airline traffic at a local and national level.

3.5 Aviation Economics first consider demand for the South West as a whole, over the period 1990 to 2012. This information is presented graphically, but summarised below.

3.6 Both Plymouth and Exeter airports saw slow but steady growth in passenger numbers from the early 1990s until 2001. Passenger numbers using Exeter Airport grew quickly from 2003 until reaching a peak of around 1 million in 2007.[16] From 2007 to 2009, there was a 22% decline in passenger numbers. Passenger numbers have since fallen less rapidly, resulting in just under 700,000 passengers using Exeter Airport in 2012.

[16] All passenger numbers based on CAA data as presented in PCC's September 2014 report, Appendix C, Figure 2, p.12

3.7 PCA, however, did not see sustained growth return after 2001, with passenger numbers fluctuating between approximately 100,000 and 150,000 per year throughout much of the decade. After reaching a peak of 160,000 in 2009, passenger numbers fell sharply until all services ceased by 2011. In PCC's economic report, Berkeley Hanover note that the difference between passenger numbers at PCA and Exeter Airport is likely driven by PCA's runway constraints, and concludes that *"had PCA acquired the runway capability to handle low cost carriers 10/15 years ago, we believe there is no reason why it should not have been PCA that became the larger airport rather than Exeter"*.

3.8 Limited data is presented for Newquay Airport as they did not provide data to the CAA prior to 2003. After reaching a peak of approximately 450,000 in 2008, passenger numbers fell sharply to below 200,000 in 2012. Aviation Economics do not report trends on passenger numbers at the larger, although geographically further away, Bristol Airport.

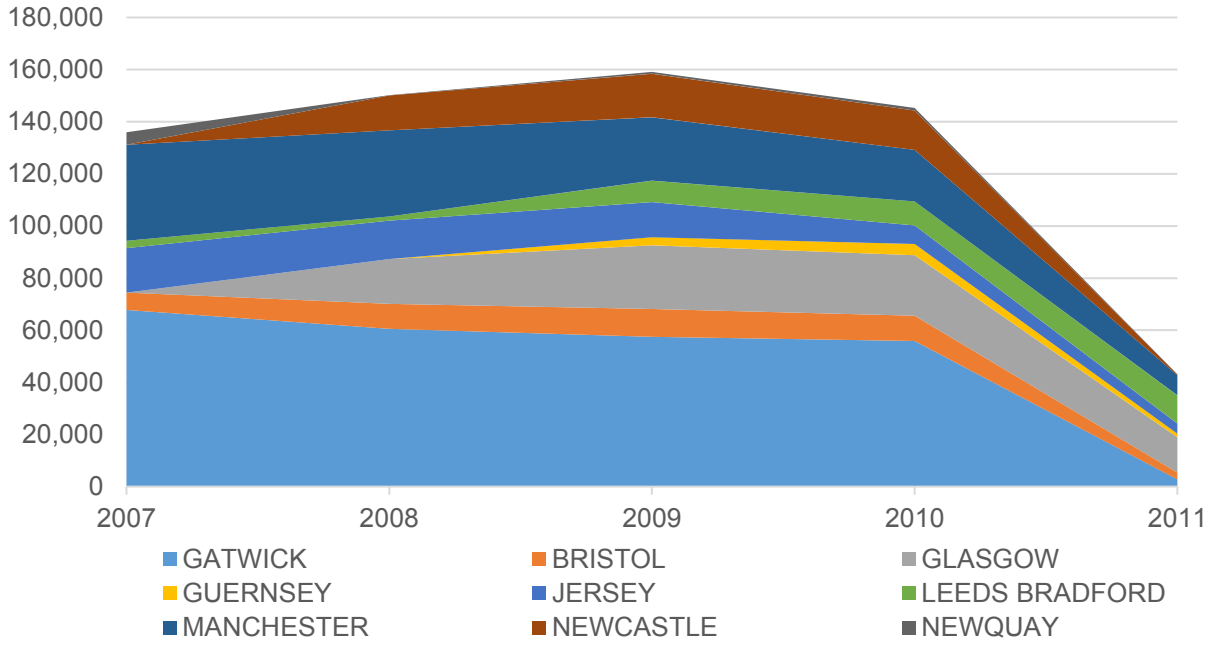
3.9 In line with these findings, Berkeley Hanover note that PCA's share of South West airport passenger traffic fell from just over 5% in 1995 to 1.4% in 2010.[17] Further declines were predicted for 2011 given the loss of the Gatwick route, with Berkeley Hanover estimating that PCA's share would fall to *"well under 1%"*.

3.10 Aviation Economics further consider passenger demand at PCA in particular. This data is summarised in Figure 3.1, which Aviation Economics provide in Appendix C of PCC's September 2014 report. Aviation Economics conclude that Gatwick, Manchester and Glasgow were the three busiest routes operated from PCA.

3.11 Aviation Economics acknowledge that recorded passenger numbers at PCA are somewhat inflated by the fact that Air Southwest ran some of its Newquay services via PCA. It is concluded that there is the possibility that Air Southwest's large turboprop operating model would not have been sustainable without this additional traffic.

[17] 'South West airports' are defined as Bristol, Exeter and Newquay in PCC's economic report.

Figure 3.1 Routes operated from PCA (annual passengers)



Source: PCC's September 2014 Report, Appendix C, Figure 2, p.4

3.12 Finally, Aviation Economics consider passenger numbers at a national level, and how this has been affected by rising levels of Air Passenger Duty (APD - discussed in section 3.1.2). While UK domestic passenger numbers rose fairly consistently from 1992 until 2005, passenger numbers later returned to their 2001 levels due to a sharp fall from 2007 to 2010. Passenger numbers did, however, remain reasonably stable between 2010 and 2012. The net effect of these trends is a 25% reduction in UK domestic passenger numbers between 2005 and 2012.

3.13 In Viable's economic impact report, York Aviation present data on transit and terminal passengers at PCA between 2000 and 2011. While these numbers may differ from those found by Aviation Economics, the overall picture of volatility throughout the 2000s is still seen.[18]

3.14 York Aviation take an additional approach to assessing recent trends in demand by considering changes in Gross Value Added (GVA), on the basis that airline demand is driven by changes in economic activity. The report notes that Plymouth performed poorly in GVA terms relative to Devon and the South West between 2007 and 2011. After considering wider economic factors including GVA per head and employment, York Aviation suggest that the data indicates that Plymouth had difficulty in growing employment in higher value added sectors. These include financial and insurance activities, business service activities and information and communication. York Aviation conclude that the Plymouth economy has struggled to keep pace with the

[18] The difference in passenger numbers reported by different studies is due to reports either referencing CAA Airport Data Table 9: 'Terminal and Transit Passengers' or CAA Data Table 12.2 'Domestic Air Passenger Route Analysis'. A summary of these tables for PCA can be found in Annex B of this study.

rest of the country over the past decade, and will continue to face similar challenges in the future.

3.15 In their business plan, FlyPlymouth consider trends for passengers making trips to and from Plymouth by any mode of transport, not just those travelling by air. The number of visitors to Plymouth remained reasonably constant from 2005 to 2008 at approximately 4m per year, but this had risen to 5.5 million by 2012. FlyPlymouth note that day visits accounted for all of this increase, rather than longer trips from domestic or international tourists. In line with this, they note that there is no clear increasing trend in the number of overnight stays.

3.1.2 Reasons for closure

3.16 The nature of the factors responsible for the closure of PCA are central to determining the long term viability of operating commercial passenger services from the airport. If largely transient in nature, it is possible that it may become profitable in the future. However, if factors are expected to persist it is unlikely that the underlying viability of a reopened PCA could change.

3.17 In Viable's economic impact report, York Aviation identify the importance of a combination of pressures from 2009 – increasing costs from fuel price rises, changes in APD, competitive pressure from Flybe at Exeter Airport, and reducing demand due to the economic downturn. It also notes that to some degree Eastern Airways' decision to cease operations may have been triggered by SHH activating their non-viability clause within the airport lease.

3.18 In Appendix C of the Plymouth Airport Study, the impact of increasing APD charges is also stressed by Aviation Economics. This references an earlier study by York Aviation which finds that APD has increased substantially as a proportion of typical fares, particularly for domestic fares – from around 10% of the value of a fare in 2007 to around 26% in 2012.[19] For international travel, this proportion is noted to have increased from between 3% and 4% to between 9 % and 14%.

3.19 In addition to market-wide trends, Aviation Economics assess the importance of airport-specific factors – in this case, size. Comparisons are drawn to the experience of other airports, including Birmingham and Coventry, where the latter has ceased offering commercial passenger services *"having failed to compete against Birmingham Airport"* (sic); Newcastle and Durham Tees Valley, where the latter faces high competitive pressure and falling passenger numbers; and in similar circumstances, Glasgow International and Prestwick airports.

3.20 Aviation Economics quote *"an industry rule of thumb"* that *"it is very challenging for airports handling under 1 million passengers per annum to operate profitably"*. This

[19] The Impact Of Air Passenger Duty On Scotland, York Aviation, October 2012 [https://s3-eu-west-1.amazonaws.com/edinburghairport/files/export/PDFs/APD+impact+update+-+October+2012.pdf]

compares to PCA's 2009 peak of just under 160,000 passengers (as reported in their own report).

3.21 Aviation Economics finally consider PCA's financial performance in the years before its closure.[20] While this period does not extend to before the financial crisis, it does cover PCA's most successful recent years in terms of passenger numbers (i.e. the 2009 peak). PCA had an operating loss margin of 23% in 2008 and 2009, and 33% in 2010. PCA's financial performance is summarised in Table 3.1 below.

Table 3.1 PCA Limited Financial Data 2008-2010

	2008	2009	2010
Turnover	£2,344,000	£3,315,000	£3,234,000
Cost of sales	£3,261,000	£4,096,000	£3,972,000
Gross profit	-£917,000	-£781,000	-£738,000
Other operating income	£17,000	£16,000	£5,895,000*
Profit for financial year	-£529,000	-£765,000	£4,791,000

*one-off land sale windfall

Source: PCC's economic report, Table 3.1, p.15

3.22 Aviation Economics conclude that this is a *"very poor result"*, and that profit was only achieved in 2010 due to a one-off exceptional income from the sale of airport land.

3.23 In PCC's commercial options report, published prior to the actual closure of PCA, Oriens note a number of factors key to the airport's poor financial performance. These include the general impacts of the economic down-turn and additional competition from Flybe as discussed above. This also stresses the importance of the loss of the Gatwick route, the limited demand seen for the high cost London City route, and the reliance on a single commercial airline operating on *"any meaningful scale"*. In PCC's economic report, Berkeley Hanover look back further, and note the loss of the Heathrow route in 1997 as the beginning of the *"slow decline in the strategic importance of the airport for the Plymouth economy"*.

3.24 Based on industry engagement, Oriens state that the business market from Plymouth was stronger than the more leisure-orientated market from Newquay – and that a number of PCA routes were deemed to be profitable. However, a number of other routes were not deemed profitable. Oriens conclude that the overarching issue was therefore a failure to find a critical mass of routes to justify Eastern Airways retaining their assets at PCA, which could be redeployed elsewhere more profitably.

[20] As reported by Berkeley Hanover in PCC's economic report

3.25 In addition to reporting the airport's financial performance, PCC's economic report contains information on Air Southwest's financial performance over the same time period. This is shown in Table 3.2.

Table 3.2 Air Southwest Limited Financial Data 2008-2010

	2008	2009	2010
Turnover	£19,934,000	£21,804,000	£21,619,000
Cost of sales	£17,472,000	£21,102,000	£24,179,000
Gross profit	£2,262,000	£702,000	-£2,506,000
Profit for financial year	£902,000	-£223,000	-£3,495,000

Source: PCC's economic report, Table 3.2, p15

3.26 While noting many of the factors discussed above, in their business plan, FlyPlymouth do not consider PCA's closure to be due to inherently structural features. Previous experience is deemed to show commercial viability for both airport and airline, with the implicit potential for future profitability.

3.1.3 Domestic connectivity in the South West since closure of PCA

3.27 In SHH's technical report, Fjøri consider the domestic connectivity issue by looking at the number of airports per capita. South West England offers the greatest number of scheduled airports per capita, with the next ranked region having more than 40% more population for the available airports. Fjøri recognise the simplicity of this measure, noting that it does not take into account catchment area overlap, nor the fact that primary airports like London Heathrow attract passengers from all over the country and primary regional ones (including Bristol and to a lesser degree Cardiff) also have a much broader catchment base. Regardless, the report concludes that this indicates the region is well served without PCA, especially given the relatively slim population density of the South West. Fjøri also note that historical traffic (per head of city population) at PCA was statistically very low when compared to Exeter or Bristol, so argues that while demand may therefore exist, passengers were not choosing to fly from the airport.

3.28 In Appendix C of PCC's September 2014 report, Aviation Economics assess the performance of the other South West airports since the closure of PCA. Bristol Airport's strong performance since 2009 is reported, with note given to plans to expand to 10 million passengers a year. Bristol Airport offered 12 domestic services in 2012, providing connections to regions across the UK. Fjøri expand on this by concluding that Bristol Airport will continue to expand at the expense of regional secondary and tertiary level airports.

3.29 Both Exeter and Newquay airports are reported as performing less well. Exeter has seen a fall in passenger numbers since 2007, but remains substantially larger than PCA. Its most important route in 2012 was Manchester, accounting for 24% of its

domestic passengers. Newquay Airport had similar passenger numbers in 2012 to PCA at its peak, but this represents a decline from historic highs. The most important route is Gatwick, accounting for 59% of domestic passengers, but with this route being supported by a four-year PSO from October 2014.

3.30 In PCC's economic report, published prior to PCA's closure, Berkeley Hanover considered Plymouth's connectivity following the loss of the PCA to Gatwick route. The report notes that *"business travellers, having previously adapted to the loss of the Heathrow service, are now adapting to the loss of the Gatwick service"*, and goes on to conclude that *"there are no signs that the inability of PCA to meet local needs for air travel has resulted in a diminution of travel to/from Plymouth and/or has had a knock-on impact to the local economy"*.

3.31 In their business plan, FlyPlymouth consider the time taken to reach various London destinations from Plymouth via different modes of transport, including a potential route from PCA to London City (FlyPlymouth's forecasts are discussed in detail in section 3.2.5). The difference in journey time required between currently available routes and a direct flight from PCA is greatest for Canary Wharf – for which the current quickest mode of transport (air travel from Exeter) would be expected to take nearly 4 hours – compared to a time of just over 1 hour and 40 minutes for a flight from PCA. Journeys to Piccadilly Circus, Westminster, Victoria and Liverpool Street show less dramatic differences, but are all of an hour or more. This implies that while connections still exist, these often take substantially more time than a direct air link.

3.1.4 Historic Demand – Conclusions

3.32 PCA is noted to have experienced fluctuating levels of passenger demand from 2001 until the financial crisis, after which a steady contraction in passenger numbers occurred. This differs from other airports in the region, notably Bristol Airport, which performed more strongly throughout the period. PCA's relatively weaker performance is considered to be largely due to the runway constraints, as the local market is considered at least as strong as those of the nearby Exeter and Newquay airports.

3.33 PCA demonstrated trends common to small airports across the UK, including APD impacts, rising fuel prices, a reduction in domestic demand and the relative strengthening of larger regional airports. In combination with increased competition from Flybe's hub at Exeter and the temporary shock of the financial crisis, PCA was unable to attract sufficient demand to operate commercial passenger services. It follows that if these factors that contributed to the reduction in demand at PCA are considered to be temporary, then this may provide further evidence that sufficient demand could exist in the future. However, if these factors are expected to persist or exacerbate, then the viability of a reopened PCA is unlikely to change.

3.2 Demand forecasts

3.2.1 'Plymouth City Airport Demand Forecast'- Aviation Economics

3.34 In Appendix C of the Plymouth Airport Study, Aviation Economics produce long-term traffic forecasts for a potential new airline operation at PCA, and assess how access to the London airport system has changed since PCA last operated.

3.2.1.1 London Market Analysis

3.35 Aviation Economics consider the future viability of PCA by first assessing the London airport market. The London market is notably important for the viability of PCA as Gatwick historically accounted for 36-50% of all PCA passengers. It is noted that Gatwick's operating approach has changed substantially since a route ran to Plymouth, as there is now an explicit goal to increase the average number of passengers per aircraft movement.

3.36 Aviation Economics note distinct changes to Gatwick's landing charges, having moved heavily toward increasing summer landing charges while reducing winter charges. Aviation Economics note that, at the time of publication, airport charges in the summer for regional services were over £57 per passenger (plus APD of £13).

3.37 Aviation Economics conclude that it is *"more or less inconceivable"* for Gatwick or Heathrow to act as a destination for a reopened PCA– meaning only London City, Luton, Southend or Stansted remain as possible London airport destinations. Aviation Economics consider none of these to offer attractive long haul connecting opportunities in their own right, or offer fast ground transport links to Heathrow. The report concludes that, for Plymouth-originating international passengers, surface access modes of travel to Heathrow might prove more attractive. This is supported by comparing the OAG[21] recommended minimum connect time between London City and Heathrow (3 hours 30 minutes) with the estimated driving time from Plymouth to Heathrow (also 3 hours and 30 minutes). This conclusion mirrors that found by Berkeley Hanover in PCC's economic report – which proposes that, at the time it was published, an expanded RAF Northolt aerodrome would offer the best potential opportunity for a link to the South East.

3.2.1.2 Demand Forecast

3.38 Aviation Economics generate estimates for potential passenger numbers at a reopened PCA by first considering demand for domestic routes. An estimate of latent passenger demand (i.e. demand currently unserved due to a lack of supply) for the City of Plymouth is generated through an analysis of traffic volumes and traffic patterns in 2008 for Exeter Airport, Bristol Airport and the London Airports,

[21] OAG is an independent, UK-based air travel intelligence company which provides digital information and applications to airlines, airports, government agencies and travel-related service companies.

airport traffic data for PCA and Newquay Airport, and by applying an estimate of the share of origin/destination passengers from the City of Plymouth.

3.39 Aviation Economics assume that 85% of demand for services at PCA came from the core district of the City of Plymouth. This figure is chosen to be slightly higher than the 79% that Exeter Airport draws from Devon County as PCA is deemed less able to draw passengers from further away given its limited route offer. Further demand is derived from passengers using other airports in 2008, with 13% of domestic traffic at Exeter originating at Plymouth, and 1% of traffic at Bristol originating from Plymouth. Aviation Economics further assume that 10% of passengers flying from Newquay originate from Plymouth.

3.40 To adjust these 2008 estimates to 2012 levels, Aviation Economics apply discounts equivalent to the changes in passenger numbers seen between 2008 and 2012 at the four airports. These are then projected forward by applying traffic multipliers and traffic maturity factors to forecasts of UK GDP. The report finds that latent demand increases from 106,866 in 2012 to 161,317 in 2032, with an average growth of 2.1% pa.

3.41 Aviation Economics assess how this latent demand might be served by an airline network, as PCA would only be able to operate a limited number of routes, and not all passengers travelling from Plymouth would be expected to use PCA. A network is built under the assumption of four main routes – London, Manchester, Glasgow/Edinburgh, and Belfast. Annual passenger numbers are based on assumed route frequencies (twice daily to London, twice daily to Glasgow via Manchester, and five times weekly to Belfast) and load factors (averaging 69%). This results in forecast passenger numbers of 108,358 in 2032, or 67% of the latent demand forecast.

3.42 Aviation Economics do not critically assess the plausibility of the above numbers. It is recognised that PCA would be unlikely to serve all latent demand (due to a lack of routes, or competition on routes that do exist), but these impacts are not quantified. It can be seen in Aviation Economics' analysis that only 49,586 of 106,866 'underlying demand' passengers from the City of Plymouth would have used Plymouth Airport. This suggests that over half of the latent demand would use either Bristol, Newquay or Exeter airports instead. Including the 15% of passengers previously using PCA who originated from outside of Plymouth City partially offsets this, but still suggests that a substantial proportion of latent demand in the South West would be served by other airports. In PCC's economic report, Berkeley Hanover note that of the 350,000 latent passenger demand in 2010, 250,000 of this was effectively diverted to other regional airports and modes.[22] This is due to PCA's inability to offer certain services (such as larger low cost carrier flights that are incompatible with PCA's runway).

[22] This latent demand refers to the region as a whole, rather than just the City of Plymouth

3.43 The above allocation is based on passenger decisions in 2008. Although not explicitly discussed by Aviation Economics, their report implies that the same level of demand for a London route may not be achievable, as Aviation Economics claim that the four potential London routes would not be as attractive as the historical Gatwick route. In a similar vein of thought, York Aviation note that a reopened airport must *"recondition"* passengers to using it in place of the alternative travel arrangements that would have been required during its closure. Both of these arguments suggest that, after closure for a number of years, it may be questionable whether a reopened Plymouth Airport would be able to recover its previous market share.

3.44 The second aspect of Aviation Economics' approach considers the potential for a limited European network. This does not use a demand approach, but again considers hypothetical passenger numbers based on assumed routes, frequencies and load factors. The report assumes that a service would be operated to major European hubs (Amsterdam, Paris, Frankfurt, Madrid or Dublin) using 50 seater aircraft at least six times a week with 65% load factors.[23] This results in European flights accounting for about 30% of expected passenger numbers at PCA. As above, the plausibility of these numbers is not critically assessed.

3.45 Aviation Economics note that connections from Plymouth would not be as comprehensive as the services operated by Flybe from Exeter – where there are daily flights to Amsterdam and Paris (the latter under a codeshare agreement) and 6 flights a week to Dublin.

3.46 When passenger numbers from domestic and European routes are combined, the report estimates that the level of traffic from a reopened PCA could potentially reach just over the 2009 peak by 2032, although it must be noted that the 2009 peak referred solely to domestic traffic.

3.47 These appended demand forecasts are considered by Arup in PCC's September 2014 report, when they asses the viability of different options for a reopened PCA. For each of the options in which commercial operations would be undertaken, it is deemed that *"insufficient demand"* exists. Resumed operations requiring an extension to the runway are ruled out from a demand perspective, as Arup conclude that airlines would consider PCA's historic demand in the region of 150,000 per year to make it a *"high risk environment"*. The closest option to maintaining PCA's operations as before closure is also ruled out on the basis of insufficient demand.

3.48 Arup consider the potential to phase reopening of PCA, with the short term operation of General Aviation activities followed by the potential resumption of commercial services should factors allow it. Although this option is ruled out in the short term due to insufficient demand, it is noted that reopening for General Aviation would allow for a decision on operating commercial services to be revisited in the future. This future situation is presented purely hypothetically, as Aviation

[23] This is compared by Aviation Economics to Flybe's average load factor for scheduled European flights in 2012 of 64%.

Economics' forecasts result in similar passenger numbers to the historic levels that Arup deem *"insufficient"*. Aviation Economics conclude that *"even if traffic levels were to go back to pre-closure levels, which AE [Aviation Economics] considers unlikely in the short to medium term, the traffic volumes will be inadequate for a commercial airline/airport operation, unless an innovative Business Plan is produced. According to SHH, annual losses are still likely to be in the order of £1m annually."*

3.2.2 'An Economic Impact Assessment of Plymouth City Airport'- York Aviation

3.49 In Viable's economic impact report, York Aviation first consider expected future developments on the basis of changes in economic activity. The report references research undertaken by the Sunday Times, using Experian forecasts of local economic growth and employment which suggests Plymouth will be within the worst 10 performing Local Authorities in the UK through to 2017. Plymouth's Local Economic Strategy 2013/14 Review indicates that, without intervention, long-run unemployment and GVA growth rates will remain below the national average to 2031. Alongside this, there is an expected widening in the 'productivity gap' due to the weak performance of industries in Plymouth, particularly in high growth sectors. It is noted that any productivity gap would reduce the attractiveness of Plymouth as a location to invest in, exerting downward pressure on demand for air travel.

3.50 York Aviation also undertake direct modelling of future passenger numbers. These forecasts are based on the state of the market in the South West in 2012, and use CAA survey data from that year. Whilst Newquay Airport was not covered by this survey, passenger use of Newquay Airport has been estimated from other airport responses. Journeys to and from airports in Cornwall and Devon are examined, including the destination and purpose of these flights.

3.51 York Aviation use 2009 CAA survey data to assess which districts in the Cornwall/Devon area that Plymouth was able to attract passengers from. This showed that on routes facing competition from other airports, passengers were attracted from eight key districts – Caradon, City of Plymouth, Cornwall Unspecified, Kerrier, Restormel, South Hams, Teignbridge and West Devon. These districts are then defined as the Core Catchment Area for PCA – roughly making up a 1-hour drive-time zone from the Airport.

3.52 York Aviation consider the top 30 destinations flown to by passengers from this Core Catchment Area, and whether or not these routes would be possible from a reopened PCA. Of the 629,500 total passengers for the top 30 destinations, only 230,000 were for routes considered *"short runway capable"*. However, it is noted that it would be exceedingly unlikely for PCA to be able to capture 100% of this demand, given nearby competition.

3.53 This baseline 2012 picture is used to develop forecast levels of demand. This represents an update to earlier forecasts by York Aviation, and accounts for lower projected demand growth, the impact of higher APD, updated (lower) underlying DfT growth rates[24], starting from the airport being closed and needing to attract passengers back, and the possible need for runway expansion.

3.54 York Aviation undertake two approaches for producing forecast passenger numbers. These different approaches were driven by the fact that since the closure of PCA some passengers might have changed transport mode, causing the 2012 air traffic figures to underestimate demand for travel, notably to London and Manchester.

3.55 The first approach, applied to the majority of routes, assumes that all passengers who were no longer able to fly from Plymouth would have switched to alternate air services, and thus would be captured by the CAA data.

3.56 The second approach, applied to the London and Manchester routes, attempts to factor in passengers who may have switched to other modes of transport since the airport closed. York Aviation summarise the approach in the following steps:

> *"1. Projecting forward the current underlying demand for point to point through the application of DfT's Growth rates for short haul and domestic services;*
>
> *2. Using 2009 CAA survey data taken at Glasgow and Newcastle, to determine market capture rates for competed services;*
>
> *3. Applying these market capture rates to the underlying demand;*
>
> *4. Applying stimulation and onward connecting passengers at typical levels;*
>
> *5. Constraining demand based on available capacity, calculated as typical load factors (65%) multiplied by aircraft size and service frequency."*

3.57 Passenger volumes are based on the period when services did exist at PCA, but adjusted to estimates of potential current values by mirroring changes in volumes seen at Newquay Airport. The number of passengers is divided into passenger types (UK/Foreign, Business/Leisure) on the basis of historic proportions observed in 2009. This proxy 2012 figure is then projected in line with DfT growth rates.

3.58 York Aviation note that passengers will use some airport destinations – notably Gatwick and Amsterdam – as *"hubs"* to transfer to other flights. The report therefore applies passenger uplifts based on typical onward connecting ratios for each destination airport. However, given the higher yield of point-to-point passengers, it is accepted that the level of underlying point-to-point demand has to be of a magnitude as to make the overall service viable for an airline. York Aviation conclude that the small size of the local point-to-point market from Plymouth is a significant constraint on the potential viability of connecting services to any one hub.

[24] UK Aviation Forecasts, Department for Transport, 2013 [https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/223839/aviation-forecasts.pdf]

3.59 A summary of York Aviation's market forecasts are shown in Table 3.3 below. It should be noted that this table includes a route to Gatwick - deemed unlikely by Aviation Economics in Appendix C of PCC's September 2014 report (see section 3.2.1 above), and a route to Amsterdam – deemed not 'Short Runway Capable' by York Aviation.

3.60 Table 3.3 shows projected passenger numbers under different possible modes of operation in both the short and long term, and the key assumptions underlying these forecasts. Passenger forecasts that are "combined with Newquay airport" reflect routes that continue onward from Plymouth to Newquay, including passengers travelling to the latter destination.

Table 3.3 York Aviation forecast demand for routes at PCA

Destination	Stimulation Rate[25]	Hubbing %[26]	2023, 19 seater	2023, 30 seater	2023, 50 seater*	Long Term, 30 seater	Long Term, 50 seater*
Amsterdam	20%	70%	0	27,300	33,100	27,300	38,700
Dublin	15%	20%	8,600	13,700	17,200	13,700	20,000
Edinburgh	20%	0%	8,600	13,700	19,800	13,700	23,300
Glasgow	20%	0%	8,600	0	10,500	0	12,400
Newcastle	20%	0%	0	0	10,100	0	11,900
Belfast	20%	0%	8,600	0	12,300	13,700	14,600
Manchester	n/a	4%	8,600	13,700	13,700	13,700	16,100
London Gatwick	n/a	55%	25,900	27,300	35,500	27,300	42,000
Total Market Size			**68,900**	**95,700**	**152,200**	**109,400**	**179,000**

*Combined with Newquay airport Source: Viable's economic impact report, Table 3.6, p.28

3.61 During consultation, York Aviation received responses suggesting that a number of consultees believed Exeter Airport could fulfil the needs of Plymouth in the long term. This was caveated by highlighting that shortcomings at Exeter Airport currently result in the frequent use of Bristol Airport or the London airports anyway. Key concerns included flight schedules not meeting the needs of business users, and the limited range of destinations served. While noting these drawbacks of Exeter Airport, York Aviation also recognise that a reopened PCA would likely suffer from similar route constraints.

3.62 Regardless, York Aviation conclude that the competitive pressure placed on Exeter Airport by Bristol Airport will always prevent the former from offering services suitable for business users, and thus discourage the approach of relying on Exeter Airport to serve the Plymouth City area.

[25] The generation of additional traffic due to the creation of a new route.
[26] The proportion of passengers using the destination airport as a hub for onward travel to their final destination.

3.2.3 'Former Plymouth City Airport Site: Independent Aviation Study' - Fjøri

3.63 Whilst Fjøri do not include any new forecasting of potential passenger numbers at a reopened PCA in SHH's technical report, they do review a number of published passenger forecasts. These are not necessarily specific to Plymouth or the South West, with some considering much broader geographies.

3.2.3.1 Airport Council International (ACI) Forecasts

3.64 ACI's global forecasts suggests that during the period 2012-2016 Europe will have the slowest growth rate of passengers after North America, with an average annual increase of 3.38%. Longer term forecasts to 2021 and 2031 continue to show Europe and North America experiencing the lowest growth rates, with Europe's falling to 2.9% per year. This is at least partly due to the relative maturity of the European and North American markets.

3.65 Fjøri deems that, given PCA's solely domestic or European traffic, traffic growth at the airport will largely be determined by economic and political issues in Europe. These include GDP growth, inflation, employment levels, aviation taxes and overall consumer confidence. This is noted to be the case for all of the South West airports, with the exception of the larger Bristol Airport. These factors have, as far as possible, been accounted for in ACI's modelling. Therefore, Fjøri's analysis of the ACI's global forecasts suggests that PCA faces a challenging environment (due to the nature of its possible traffic) in a less buoyant part of the world for aviation demand.

3.2.3.2 Eurocontrol Forecasts

3.66 Eurocontrol published a seven-year forecast of flight movements for the period 2012-2018 in October 2012.[27] At the time high oil prices, a weaker economic outlook, and other recent events (airline failures, slower-than-expected recovery from the Arab Spring, etc.) led to a downward revision of earlier forecasts.

3.67 This resulted in an expected 1.5% fewer flights in 2012, followed by stagnation in 2013. By 2018, IFR (Instrument Flight Rules) movements in Europe were predicted to be 14% higher than in 2011, with growth averaging 1.9% per year for the whole 2012-18 period.

[27] Eurocontrol is a 41-state intergovernmental organisation which works to achieve safe and seamless air traffic management across Europe, and deliver air traffic management performance improvements for the future.

3.2.3.3 Department for Transport Forecasts

3.68 DfT publishes long-term forecasts for passengers using UK airports. These are based on passenger survey data and forecasts of macroeconomic variables such as GDP, and provide estimates for passenger demand at an airport and route specific level to 2050. Fjøri report on two sets of these forecasts, from 2011 and 2013. The latest forecast projects a recovery in UK air passenger numbers following the economic crisis, rising from 211 million passengers per annum (mppa) in 2010 to 335 mppa in 2030, and to 470 mppa in 2050. Fjøri note that the implied annual growth in passenger numbers to 2050 of 2.0% is significantly lower than the 5% average seen over the past forty years.

3.69 The above figures refer to DfT's central estimates for forecast demand, but uncertainties exist around these. A range of 'high' and 'low' scenario forecasts vary numerous assumptions including the extent to which a 'bounce-back' was likely to occur following the economic crisis.

3.70 Fjøri report on DfT's estimated increase in Air Traffic Movements (ATMs) and terminal passenger capacity at selected airports between 2008 and 2050, with the earlier 2011 forecasts included for PCA (as this was the final year PCA was included in the DfT forecasts).

3.71 Fjøri suggest that, based on these forecasts, Exeter and Bristol airports might have the greatest potential for traffic growth amongst airports in the South West for the period to 2030. Fjøri suggest that the longer term forecasts indicate that PCA is able to grow *"slightly more robustly"* than the more established Bristol Airport, but not as robustly as Exeter Airport.

3.72 DfT's forecasts of origin and destination passengers, which make up the vast majority of passengers at airports in the South West, find growth from 12 million in 2012 to 26 million in 2050 (an increase of 217%).

3.73 Fjøri determine that, over a 40 year period, the South West is forecast to experience the second slowest rate of growth for origin/destination passengers.

3.2.3.4 Fjøri's conclusions

3.74 Fjøri conclude that, whilst capacity constraints in the London area mean that the majority of growth in UK air traffic will occur at 'regional' airports, there are a number of factors having a dampening effect on the likely future level of demand at a reopened PCA:

- as the relatively mature European market is expected to experience economic stagnation in the short to medium term, airports relying on domestic / short haul flights will see slower growth in traffic;
- in the UK, slower growth is compounded by a lack of consumer confidence and aviation taxes;

- continued growth in rail travel throughout Europe will impede air traffic growth; and
- the South West is expected to experience the second lowest growth rates in origin/destination passenger journeys to 2050.

3.2.4 FlyPlymouth's Business Plan

3.75 In their business plan, FlyPlymouth make use of the aforementioned demand forecasts produced by Aviation Economics and York Aviation, historic passenger data, and the views of two aviation economics experts to generate estimated passenger numbers at a route specific level. Though this differs from the other forecasts by only including routes to UK airports and Dublin. These are summarised in Table 3.4 below.

Table 3.4 FlyPlymouth's forecast demand for routes at PCA in the fourth year of commercial passenger services (2021/22) under FlyPlymouth's business plan

Destination	Capacity	Load factor	Passengers	Forecasts[28]
London	81,144	39%	31,646	33,495
Manchester	57,244	26%	14,878	15,694
Glasgow	47,656	46%	21,922	22,855
Dublin	33,304	44%	14,654	15,515
Edinburgh	42,872	39%	16,720	17,861
Total			99,820	105,420

Source: FlyPlymouth's business plan, p.26

3.76 These numbers are broadly comparable with previous reports' estimates of short term passenger demand for domestic routes. FlyPlymouth note that possible longer term routes to Amsterdam and Newcastle would then deliver higher passenger numbers more similar to the other reports' long term forecasts.

3.77 Based on the distribution of passengers at Newquay in 2012, FlyPlymouth predict that 23% of passengers will be business, with leisure comprising the other 77%. Passengers are primarily expected to change modes from car to air transport and not to divert from other forms of public transport, as FlyPlymouth's target market is the convenience travel market, not the low fares market.

3.78 FlyPlymouth's business plan contains break-even analysis to consider the maximum oil price and minimum number of passengers required to make a joint airline / airport operation commercially viable. The break-even number of passengers is estimated to be approximately 84,000 per year. This is compared to Air Southwest's average of 96,000 passengers per year, with the report concluding that it is *"unlikely that once the airline has become re-established that passenger numbers will fail to achieve break-even levels"*.

[28] FlyPlymouth's combined interpretation of forecasts by Aviation Economics and York Aviation.

3.2.5 Demand forecasts – Conclusions

3.79 Three quantified forecasts of potential demand for a reopened PCA have been considered by this literature review. These find broadly consistent estimates of possible passenger numbers - approximately 100,000 in the shorter term, rising to previous peaks of over 150,000 in the longer term.

3.80 Estimates of domestic demand have largely been driven by available CAA data, but it must be noted that there are two potential sources of historic CAA data for PCA.[29] Depending on which source forecasts are based on will affect the projection of passengers at PCA. These sources can be found in Annex B.

3.81 The PCA specific forecasts discussed have been contextualised with more generalised forecasts of passenger demand at a regional, national and European level. Fjøri's assessment of previous forecasts in SHH's technical report finds the South West region to perform poorly relative to the nation as a whole, and Europe to experience lower growth than the global market.

3.82 Overall there is no consistent evidence across the reports to suggest that there would be sufficient demand for commercial passenger services at a reopened PCA.

[29] One of which includes transit passengers and international passengers, while the other does not.

4. Future developments in the aviation market and other relevant factors

4.1 Introduction

4.1 Future developments which could affect demand for commercial passenger services at PCA are particularly pertinent to the discussion on recommencing commercial passenger services at PCA, as the ability for PCA to adapt to developments in the aviation market is ultimately restricted by its supply constraints. Furthermore, both FlyPlymouth's business plan and PCC's September 2014 report discuss the prospect of a phased reopening, whereby PCA is initially opened as an airfield for General Aviation only and thereafter, commercial passenger services are reintroduced. Even interim short term changes in the aviation market could reduce the viability of re-introducing commercial passenger services at PCA.

4.2 Future developments in the aviation market

4.2 In PCC's September 2014 report, Arup discuss seven potential changes in the aviation market which could affect a reopened PCA, which the authors of SHH's review of the case for safeguarding provide a direct response. A comparison of their conclusions on each of these potential developments are discussed below.

4.3 **Economic Growth**: Arup note that economic growth is a key driver for air traffic growth. Arup suggest that the projected annual increase in demand for air travel of 1%-3% up to 2050 will contribute towards excess demand at London and Manchester airports, causing difficulties in obtaining peak time landing slots. Arup and the authors of SHH's review of the case for safeguarding both point to Aviation Economics' forecast of passenger numbers at a reopened PCA in PCC's September 2014 report, which would be below historic market levels going forward until 2032. SHH's review of the case for safeguarding states that economic growth is not a reason to safeguard PCA, and that future business cases should be based on long term passenger forecasts.

4.4 **Aircraft Technology**: Arup explain that long-term rising oil prices, evolving technology and the increasing prevalence of environmental considerations have encouraged the development of larger and more fuel-efficient aircraft. An example of this is given as the Bombardier C-Series in 2013, which is aimed at the 100 seat to 150 seat regional market. However, Arup state that the specification of these future aircraft (at the time) was unknown, so their capabilities (such as whether or not they would be capable of landing on PCA's runway) couldn't be assessed. Arup propose that a further review of options would need to be undertaken to determine the capability of future aircraft at a reopened PCA. However, the authors of SHH's review of the case for safeguarding argue that there is no guarantee that future

aviation technology would be owned by a suitable airline for PCA and that the growth point is likely to be around 100 to 125 seat narrow-body jet market. The authors further claim that there is neither sufficient supply nor viable demand to accommodate these aircraft, as the *"ideal target "* runway length for these aircraft is 1,400 metres and, according to the authors, Appendix C of PCC's September 2014 report proves that it would be *"very challenging"* to fill aircraft of that size.

4.5 **Air Passenger Duty (APD)**: Arup suggest that the 2015 consolidation of band C and D APD into band B will have a limited impact on the viability of resuming commercial passenger services at PCA, as this will save money on long haul destinations greater than 4,000 miles, rather than the routes PCA historically served. Arup state that the impact of changes in APD on the viability of PCA cannot be assessed. The authors of SHH's review of the case for safeguarding claim that Aviation Economics' route fare breakeven analysis in Appendix C of PCC's September 2014 report reflects the poor likelihood of sustainably attractive fares being provided by airline operators. They conclude that changes to APD will not have an impact on the viability of a reopened PCA.

4.6 **Consolidation of Regional Airports:** Arup ascribe recent closures and financial losses at regional airports to a broad trend towards consolidation of route networks at larger airports and a reduction in destinations served from smaller airports. Arup claim that this gives larger regional airports, such as Bristol, a *"more prominent position in the market"*, resulting in a greater challenge for PCA to compete with services offered elsewhere. The authors of SHH's review of the case for safeguarding agree that consolidation of regional airports and airlines with standardised fleets will create further difficulties for PCA to operate sustainably.

4.7 **Growth of neighbouring airports and Plymouth's transport infrastructure**: Arup suggest that a prolonged closure of PCA will lead to other airports in the South West establishing a stronger position in the market, making reopening PCA more challenging. Arup suggest that a development in Plymouth's road and rail connections with Exeter and Bristol airports and with London would improve Plymouth's connections, though this is not explicitly linked to the viability of resuming commercial passenger services at PCA. The authors of SHH's review of the case for safeguarding continue to refer to Aviation Economics' route breakeven analysis in Appendix C of PCC's September 2014 report, claiming that passenger fares would be unsustainably uncompetitive compared to nearby airports and rail options.

4.3 Other relevant factors

4.8 **The condition of PCA assets**: Arup claim that continued retention of PCA for purposes other than aviation will result in continuing erosion of airport infrastructure, and that this will have a subsequent impact on the necessary financial expenditure required to re-establish aviation services at PCA. The authors of SHH's review of

the case for safeguarding agree, claiming that *"unless PCC invests in ongoing annual maintenance and renewal during the safeguarding period then assets will continue to age and become obsolete."*

4.9 **CAA Licensing**: Arup specifically reference CAP 1188, published in May 2014 by the CAA, which states: *"Not all risks can be effectively mitigated, and in some cases the cost of mitigating the risk will outweigh the aggregate safety benefit. For these reasons the CAA must focus its finite resources on mitigating those risks which are most important."* Arup indicate that the CAA could allow dispensations to licensing standards at PCA, which they consider to be restricting the viability of an operational aerodrome at PCA. However, Arup claim that this would require *"a strong business case…and a demonstration that equivalent safety standards could be reached through alternative mitigation measures"* and that there is uncertainty of reform, thus changes to the regulation of aerodromes could be positive or negative.

4.10 As CAP 1188 is the policy framework for General Aviation, the authors of SHH's review of the case for safeguarding assume that Arup are specifically discussing the regulation of General Aviation airfields. The authors suggest that there is not *"sufficient regulatory uncertainty to warrant safeguarding"* as, according to the report, it is fully understood that the key regulatory aspect in the CAP 1188 is that the *"CAA will maintain their oversight on licensed aerodrome safety through the harmonised EASA regulatory process and the methods known as equivalent level of safety."*

4.4 Conclusions

4.11 There are a number of uncertainties around the future development of the aviation market, and these are not necessarily restricted to those discussed in the reports reviewed. In particular, the reports assessed have highlighted that it is uncertain whether future aircraft types will be compatible with PCA's runway.

5. Potential commercial viability of a reopened Plymouth City Airport

5.1 This section looks at the reports' assessments of the potential commercial viability of a reopened PCA. This brings together aspects of both passenger demand and supply constraints, as each of these affect the financial viability of running commercial passenger services at an airport.

5.2 When discussing the likelihood of an airline starting commercial passenger services at PCA, the reports take vastly different approaches. However, taken as a whole, the literature indirectly addresses the following questions:

- Would an airline or airport operator be willing to cover the initial capital costs from reopening PCA for commercial passenger services?
- Would airlines generate sufficient profits to operate commercial passenger services at PCA, without public subsidy, given anticipated demand levels and costs?[30]
- Would any existing airline be willing to operate commercial passenger services at PCA, given their business structure and existing fleet?

Each of these questions is respectively addressed in sections 5.1, 5.2 and 5.3.

5.3 In SHH's technical report, Fjøri restrict their scope to *"matters of a technical, operational and demand nature"*, specifically ruling airport economics out of scope, and as such do not fully evaluate capital costs and profitability in any detail. They do, however, assess the changing composition of aircraft fleet and discuss the viability of an airline resuming commercial passenger services, based on business structure and existing fleet, using a shortlist of 18 airlines.

5.4 In PCC's September 2014 report, Arup review a range of options for reopening PCA using an assessment matrix. The options which involve scheduled commercial passenger services are listed in table 5.1.[31] The assessment matrix looks at the likelihood of investment from the perspective of financial viability and feasibility. The matrix also includes wider economic benefits, which are not considered in scope for this study. This partly incorporates Arup's conclusions from Appendices B and J on infrastructure costs of runway scenarios and Aviation Economics' analysis from Appendix C on possible PCA airline operators and route break-even fare analysis.

[30] Airport operators can also provide airlines services. For example, the former airline serving PCA, Air Southwest, was owned by the airport's operator SHH from 2003 to 2010.
[31] Option 6, a two-stage approach where the airport is reopened for general aviation only, and then commercial passenger services are introduced at a later stage, is not included in this report as the second stage is already captured by Option 4.

Table 5.1: Airport options, involving scheduled commercial passenger services, considered by Arup in PCC's September 2014 report

Airport option	Runway option	Other key components
1: Open PCA as a commercial RFFS[32] CAT 6 Airport with expansion of operations	Code 3 non-instrument runway	. Runway strengthening to support 100 seat + aircraft . Terminal refurbishment and expansion . Land purchase, demolition and earthworks . Construction of a taxiway bypass
2: Open PCA as a commercial RFFS CAT 5 Airport with a limited expansion of operations	Extended code 2 runway (10% dispensation)	. Operations for 50-70 seat aircraft range . Instrumentation runway modifications . Land purchases demolition and earthworks . Terminal refurbishment and expansion . Construction of a taxiway bypass
3: Open PCA as a commercial RFFS CAT 5 Airport	Existing Runway with 90m RESAs	. Small expansion of the runway paved area . Instrumentation runway modifications . 50 seat turboprop aircraft
4: Open PCA with limited commercial services RFFS CAT 3 Airport	Existing Runway with 90m RESAs	. Instrumentation runway modifications . Scheduled operations limited to 19 seat aircraft . Maximum 700 movements in busiest three months of the year, for aircraft allowed under RFFS CAT 4 (50 seat aircraft)

Source: PCC's September 2014 report, p.18-20

5.5 FlyPlymouth's business plan proposes a staged approach, where PCA is initially reopened for General Aviation purposes and then scheduled commercial passenger services are eventually reintroduced, in a similar manner to Option 3. As such, the report analyses the capital expenditure required to provide the commercial passenger air services for 50 seat turboprop aircraft, as well as a detailed financial breakdown of expected costs and revenues. Therefore, the commercial viability of the reintroduction of commercial passenger services, as presented in FlyPlymouth's business plan, is considered within the scope of this study. However, due to the commercially sensitive nature of the business plan, detailed financial information has been withheld from this literature review as confidential.

5.6 In PCC's economic report, Berkeley Hanover assess the financial risk (to PCC) of five options for the future of PCA. As Arup use this report as part of the evidence base for PCC's September 2014 report, the options including scheduled commercial passenger services are the equivalent of Options 3 and 4 in PCC's September 2014 report.

[32] Provision of Rescue and Firefighting Services (RFFS) at all UK airports and aerodromes is a legal requirement under UK and international agreements set out by the International Civil Aviation Organisation (ICAO). UK airports are categorised from 1 to 10 dependent on the type and size of aircraft they handle.

5.7 In PCC's commercial options report, Oriens also assess the commercial viability of two options relating to commercial passenger services, which are equivalent to Options 3 and 4. This is undertaken in Appendix C of the report, which provides a table showing the expected costs and revenue streams under each option. Three scenarios are presented for option 3 depending on the number of commercial passengers at PCA (100,000, 150,000 and 200,000).

5.8 Both Aviation Economics, in Appendix C of PCC's September 2014 report, and Berkeley Hanover, in PCC's economic report, consider the extent to which the profitability of scheduled commercial passenger services in Option 4 would be dependent on the return of the Royal Navy FOST (Flag Officer Sea Training). Whilst General Aviation is not considered within the scope of this study, it is appropriate to reflect reports' conclusions where they discuss the presence of General Aviation in relation to the viability of commercial passenger services.

5.1 Capital expenditure

5.9 In Appendices B and J of PCC's September 2014 report, Arup analyse the capital investment required for the various airport options, a full breakdown of which can be seen in table 5.2. Risks and opportunities, which could lead to costs being higher or lower than forecasted, are outlined in Appendix B. Examples of these include a reduced requirement for a resurfaced runway, which would ease costs, and the full replacement of ILS and Distance Measuring Equipment (DME) systems being required, rather than just re-commissioning, which would increase costs. There are also a number of exclusions in the capital expenditure analysis. For example: cost of land and leasehold acquisition, site clearance and demolition, licensing/permit costs, and reinstating/installing navigational aids.

5.10 Though land and leasehold acquisition are excluded from the analysis undertaken in Appendix B, Arup discuss these costs in their assessment matrix in the main body of PCC's September 2014 report. They conclude that the cost of obtaining the leasehold, though unknown, would significantly increase financial expenditure and exposure, and that the current leasehold owners, SHH, will only consider land values associated with the development potential of the former airport site, not the existing use value. Arup note that the cost of land acquisition is also unknown for Options 1 and 2 but that both would require compulsory purchase of active employment land that would need to be taken into account in any business plan. In PCC's economic report, Berkeley Hanover suggest that a high cost lease transfer will add significantly to the financing required to reopen PCA.

5.11 Options involving a major extension to the runway (Options 1 and 2) are ultimately ruled out by Arup on the basis of the "*prohibitively expensive"* capital investment requirement, as airline operators would not be able to justify this level of capital expenditure given historical demand levels. Options which do not require a major

runway extension (Options 3 and 4) are not dismissed on the basis of capital expenditure.

Table 5.2: Capital expenditure of airport options, which involve commercial passenger services, considered by Arup in PCC's September 2014 report, presented in *"real terms based on 2013 construction prices"*

Element	Option 1	Option 2	Option 3	Option 4
Enabling Works	£27,847,813	£8,269,750	£280,000	£280,000
Aeronautical / Terminal Expenditure	£2,813,400	£2,813,400	£2,813,400	£2,250,600
Airside Infrastructure	£11,173,253	£8,723,909	£2,839,675	£2,839,675
Ancillary Facilities	£420,000	£420,000	£420,000	£120,000
Infrastructure	£600,000	£600,000	£600,000	£600,000
Contractors Preliminaries	£5,356,808	£2,603,382	£869,134	£761,284
Professional Fees	£4,285,447	£2,082,706	£695,308	£609,028
Risk / Contingency	£17,141,786	£4,165,412	£1,390,615	£1,218,055
Total	**£69,638,507**	**£29,678,560**	**£9,908,132**	**£8,678,642**

Source: PCC's September 2014 report, Appendix J, p.7

5.12 In their business plan, FlyPlymouth dispute the capital expenditure evaluation by Arup for Option 3. As FlyPlymouth intend to lease some capital equipment (such as the aircraft fleet, fire and rescue services, and security), FlyPlymouth claim that this would not form part of the expected start-up expenditure. FlyPlymouth further argue that savings could be made if the ILS equipment is leased, or a GPS approach system is used instead.

5.13 Therefore, FlyPlymouth conclude that only £791,740 in capital expenditure will initially be required to reopen the airport and establish an airline, rather than the £9,908,132 estimated by Arup. A breakdown of FlyPlymouth's capital expenditure costing is provided in table 5.3.

Table 5.3 Capital expenditure accounted for in FlyPlymouth's business plan[33]

Element	FlyPlymouth's Capital Expenditure Estimate
Licence application and implementation costs	£100,000
Runway repairs and markings	£15,000
General dilapidation & repair expenditure	£150,000
Consultant and professional fees	£100,000
Legal services	£50,000
Accountancy services	£25,000
Other regulatory costs	£15,000
Terminal repairs/redecoration	£150,000
Terminal fixtures and fittings	£15,000
Rescue and fire-fighting equipment	£67,740
Other site repair costs	£34,000
Other costs	£42,000
Car parking equipment and re-commissioning	£18,000
Stand by power equipment	£10,000
Total	**£791,740**

Source: FlyPlymouth's business plan, p.53

5.14 The other studies do not fully evaluate the capital expenditure of resuming commercial passenger services at PCA. In PCC's economics report, Berkeley Hanover focus more on continuous profitability rather than capital expenditure of the airport options that are discussed, though they verify that any lengthening of the runway beyond the boundaries of the airport would be prohibitively expensive. Regardless, it can be assumed that Arup's assumptions on capital expenditure supersedes any council report which was published prior to the airport closing, as it can be expected that capex required will have since increased.

5.15 As discussed in section 2.1, in SHH's technical report, Fjøri rule out any option involving a major runway extension due to the inability to extend beyond 1,199m TODA without increasing the runway width (which is dismissed due to the capital costs resulting from compulsory purchases, highway realignment and significant

[33] Assuming reopening date of March 2017

earthworks) or becoming a non-instrument runway (which is dismissed due to an instrument runway being *"imperative"* for credible commercial operations).

5.16 As there is general consensus amongst the reports that extending the runway beyond the CAA-compliant Code 2 runway TODA of 1,199m is not a viable option due to the capital expenditure required, Options 1 and 2 are not discussed further in this chapter.

5.2 Profitability

Option 3: Open PCA as a commercial RFFS Category 5 Airport

5.17 Whilst acknowledging that this option requires less capital than those involving a major extension to the runway, Arup ultimately dismiss resuming 50 seat commercial passenger services at PCA due to a lack of sufficient demand to generate an operating surplus. They point to Aviation Economics' analysis in Appendix C of the report, which shows that, at its peak throughput of less than 160,000 passengers in 2009, PCA ran an operating loss of 23%. Given that Aviation Economics' demand forecast shows that this peak wouldn't be reached until 2032 (if the airport were to have reopened in 2012), Arup conclude that, even if demand levels returned to pre-closure levels, demand would still not be sufficient in the medium to long term to support Option 3, without an airline or airport subsidy. Arup also point to the *"very high operational costs"* of airport capacity requirements, staffing requirements, maintenance, refuelling and obtaining slots at other airports.

5.18 In Viable's economic impact report, York Aviation do not consider viability or profitability of a reopened PCA in their study. As shown in Table 3.2 in this literature review, York Aviation find that passenger numbers could reach 179,000 by 2030, if services were combined with Newquay Airport. This is not significantly different from Aviation Economics' forecast. In their business plan, FlyPlymouth forecast that passenger growth will reach just under 100,000 passengers per year by the fourth year of commercial passenger services (2021/2022). Thus, if the same framework were used, it is unlikely that Arup would argue that York Aviation's or FlyPlymouth's demand forecasts support the case for financial viability. However, referencing their own break-even analysis, FlyPlymouth claim that only 84,000 terminal passengers per year would be required for a joint airline / airport operation to break-even.

5.19 Whilst all three reports look at historic CAA Airport data for terminal passenger numbers at PCA, Aviation Economics use 'domestic air passenger route analysis', whereas York Aviation and FlyPlymouth reference terminal and transit passengers. These tables are provided in Annex B of this study. The authors of this study have not yet been able to confirm why there is a discrepancy between these two tables.

5.20 FlyPlymouth do not suggest that a reopened PCA under Option 3 will be financially viable in the short term without government subsidy or support, as their business case includes £4 million in government loans (or an alternative) to help cover site

acquisition costs, recommissioning costs and initial operational losses. Further to this, the business case assumes that support from the Regional Air Connectivity Fund (RACF), totalling £5 million across the first three loss-making years of commercial passenger operations, will be provided by the Government.

5.21 In PCC's economic study, Berkeley Hanover also discuss the financial viability of an option similar to that of Option 3 in PCC's September 2014 report. They conclude that the financial risk of this option is high to any operator at PCA, as a new airport operator would need to decrease operating costs by around 10%, whilst increasing revenue by the same amount, in order to break even. Berkeley Hanover conclude that there is a high risk of a subsidy of at least £1 million per year being required. Thus, they conclude that there is no chance of profitability for an airport operator at PCA in the short to medium term.

5.22 When assessing the commercial viability of Option 3 in PCC's commercial options report, Oriens find that the airport will only become marginally commercially viable if it achieves 150,000 commercial passengers per year, and this profit will only fully materialise with 200,000 passengers. Oriens note that their analysis does not include debt repayment or depreciation, and that most operators would be looking to gain an Internal Rate of Return (IRR) of 12-15% for low risk investments, and over 25% for high risk investments. An evaluation of potential airport operators found that there is *"little or no chance"* of an operator resuming at PCA, aside from an option in which a number of small South West airports are managed by a single operator to gain economies of scale.

Option 4: Open PCA with limited commercial services RFFS Category 3 Airport

5.23 When assessing whether sufficient demand exists for Option 4 in PCC's September 2014 report to be deemed commercially viable, Arup analyse previous consultations and surveys to Plymouth based industries. They find that in 2011, the year the airport closed, only one out of the 23 companies who responded to a Berkeley Hanover consultation agreed that the existing air services were of major importance to its operations (Glasgow, Manchester and Leeds). Similarly, in 2013, eight of the 22 Chamber of Commerce companies surveyed by Arup agreed that the loss of PCA changed the way they did business. Several companies also considered that they had lost business as a result of the airport closing and seven considered that the re-establishment of air connections would be of small benefit, dependent on available destinations. Arup conclude that Option 4 would not be financially sustainable given this level of demand.

5.24 Arup also conclude, from Aviation Economics' breakeven fare analysis for 19 seater planes, that Option 4 would be an *"ongoing loss making operation"*. A brief summary of Aviation Economics' breakeven fare analysis is discussed below.[34]

[34] Although Aviation Economics applied their analysis to larger aircraft too, Arup did not incorporate this into the assessment matrix in PCC's September 2014 report.

- Assuming a 75% load factor, a one way fare from on a twice-daily Plymouth-Stansted route would cost £132 per passenger, excluding APD.[35] This is considered *"exorbitantly high"* by Arup in PCC's September 2014 report. Aviation Economics' analysis suggests this fare would be even greater on a London City route. Aviation Economics compare this to peak-time train tickets, which (in 2014) ranged from £30-£46 for standard class and £72-£149 for first class, depending on whether advanced tickets or next day tickets were purchased. This comparison does not however take into account potential time savings for passengers, for which a monetary value can be assigned.

- Assuming a 65%-75% load factor, a one way fare on a daily Plymouth-Manchester route would range from £102 to £248, excluding APD. Aviation Economics' compare this to an average one way fare of £73 (in 2013) on the Exeter-Manchester Flybe Q400 route.

- Assuming a 65%-75% load factor, a one way fare on a daily Plymouth-Glasgow route would range from £147 to £377, excluding APD. Aviation Economics' compare this to an average one way fare of £75 (in 2013) on the Exeter-Glasgow Flybe Q400 route. It is not stated whether this fare includes APD.

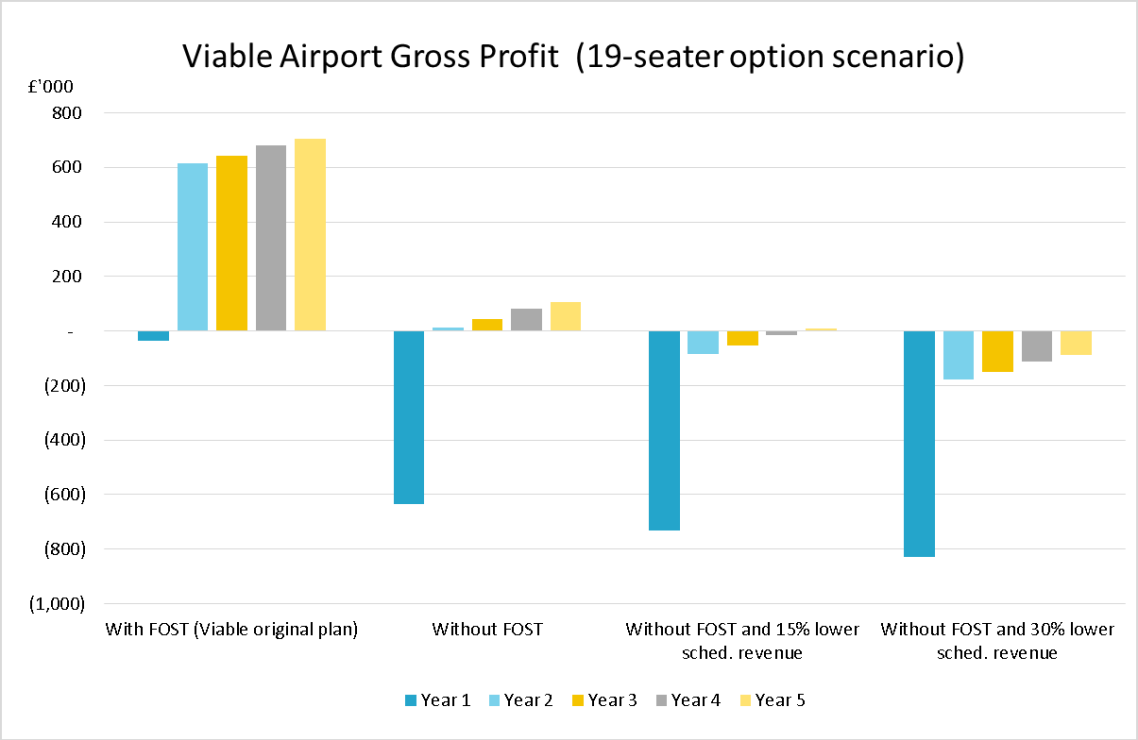
5.25 Arup further discuss the operational costs of Option 4, and whilst acknowledging that the staff and running costs would be much lower than Options 1-3, these would still be high relative to the intensity of aviation activity predicted as taking place on site.

5.26 In PCC's economic report, Berkeley Hanover's risk analysis of Option 4 is similar to that of Option 3, except that they identify a medium risk of failure to find an airline and a medium risk of generating sufficient passenger revenues.

5.27 The dependence of Viable's initial business plan on FOST activities is considered by Aviation Economics in Appendix C of PCC's September 2014 report. Aviation Economics apply sensitivities to Viable's airport financial plan for 19 seat scheduled services, which is similar to Option 4. From Figure 5.1, Aviation Economics conclude that the viability of Viable's business plan is highly dependent on securing FOST activity. A 15% and 30% lower scheduled revenue sensitivity is included to reflect the uncertainty on the viability of a scheduled airline operator. Is should be noted that Viable's initial business plan has since been superseded by FlyPlymouth's business plan.

[35] Aviation Economics assessed break-even fares for various aircraft at 55%, 65%, 75% and 85% load factors, without forming an explicit judgement on which could be considered most likely.

Figure 5.1 Aviation Economics' analysis of Viable's financial plan



Source: PCC's September 2014 report, Appendix C, Figure 16, p.32

5.28 In PCC's economic report, Berkeley Hanover further highlight that FOST income provided £250,000 of yearly revenue to the airport, whilst there would be little cost-saving from cessation of activities. Berkeley Hanover conclude that, with FOST activities, an operator of PCA will be able to cover their costs but, without FOST activities, the operator is likely to face losses of £150,000 per year.

5.29 Berkeley Hanover suggest that there is a low risk of FOST leaving PCA. However, in SHH's review of the case for safeguarding, the authors highlight that the Royal Navy FOST service has since been relocated to a "temporary facility" in HMS Raleigh, with a £4 million helipad facility in the Devonport Naval Base being planned. When discussing the option to mothball the PCA site, Berkeley Hanover acknowledge that other aviation activities at PCA will move to other sites, thus reducing the likelihood of generating revenues from these sources.

5.30 These arguments are further reflected in PCC's commercial options reports. Oriens find that an RFFS Category 3 airport with 19 seat aircraft, similar to that discussed in Option 4, would be expected to make a profit of £27,500 (excluding capital expenditure) and generate 70,000 terminal passengers. However, this includes £180,000 in FOST revenue, £152,500 in General Aviation revenue and £125,000 in revenue from private aircraft. Oriens suggest that, even if it is assumed that FOST will remain at PCA, a private airport operator is highly unlikely to invest in PCA unless PCC entered some form of underwriting that *"offers the prospect of an acceptable level of return"*.

5.31 FlyPlymouth expect that Devon and Cornwall police and ambulance air services would make *"good use"* of the reopened airport, and that military aviation would also be welcomed, as well as other forms of General Aviation.

5.3 Potential Airlines

5.32 Four studies discuss the potential for specific airlines to resume commercial passenger services at PCA in greater detail.

5.33 In SHH's technical report, Fjøri undertake a qualitative assessment of 18 possible airlines which could start commercial passenger services at PCA assessing the likelihood of an airline flying to/from Plymouth as: 'good potential', 'potential', 'limited potential', 'low potential', 'negligible potential' or 'never'. The only airline considered to be a potential candidate, indicating a 50% chance of a selected route operation, is CityWing, a virtual airline[36] formerly known as Manx2. Fjøri do not assess the possibility of a new commercial airline starting services at PCA.

5.34 In SHH's review of the case for safeguarding, the authors provide a more condensed update to Fjøri's previous analysis, which ultimately concludes that there is *"no likelihood that a commercial airline would wish to operate at Plymouth"*. They attribute this to the fact that potential regional airlines, such as Stobart Air and Aurigny Air Services, do not have a focus on South West England, and due to the lack of evidence that they would be more profitable than Eastern Airways who *"failed to operate successfully from Plymouth"*.

5.35 In Appendix C of PCC's September 2014 report, Aviation Economics discuss nine possible airline operators at PCA, including a new start up. They find that Aer Arann (which has since been acquired by Stobart Air), could provide a Plymouth to Southend route, due to the airline's mandate to provide services from Southend. It is also suggested that Aurigny, Eastern Airways and Loganair could provide non-London domestic routes, though Aviation Economics acknowledge that Eastern Airways are unlikely to reverse their decision to cease operation at PCA. Other commercial airlines discussed are disregarded due to their current fleet being too large or the airline having a focus on primary bases.

5.36 The scope of PCC's commercial options report means that prospective airlines must also be willing to start services within three months (as of August 2011) due to the PCA having been scheduled to close by December 2011 if an alternative airport operator and airline were not found before this time. However, some information on the interest of airlines can be garnered by Mott Macdonald and Orien's research into potential airlines at PCA. Oriens find that many of the carriers contacted were either not interested in serving Plymouth or required subsidy. Aer Arann, Loganair

[36] `Virtual airline' refers to CityWing's mode of operation in selling seats on scheduled air flights operated under charter from VanAir Europe.

and Manx2 each expressed interest in operating one or more routes, but were restricted by fleet or the deadline required for commitment.

5.4 Potential commercial viability – conclusions

5.37 There is general consensus amongst the reports reviewed in this study that a runway at PCA with a TODA of 1,199m would not be financially viable due to the capital expenditure required to fund such an extension. Whilst lower capital expenditure would be required to resume commercial passenger operations similar to before closure or to resume operations on a smaller scale, there is no evidence from the reports assessed to suggest that this will be profitable in the short term. Of the two reports assessed which fully endorse reopening PCA for commercial passenger flights, only FlyPlymouth's business plan assesses financial viability. This business plan, however, is still loss-making in the first five years of operation, which includes three years of commercial passenger services with an assumed input from the Regional Air Connectivity Fund of £5 million.

5.38 FlyPlymouth consider annual passenger demand of as little as 84,000 to be sufficient for a joint airline / airport operation to make a profit. Arup however consider PCA's historic demand of approximately 150,000 per year, which is of the same order of magnitude of long-term forecast demand, to make it a "high risk environment". There is therefore no consistent evidence from across the reports to suggest sufficient demand exists for viable commercial services to be operated at PCA.

5.39 Additionally, the reports find risks to the viability of a reopened PCA in the form of possible future developments in the aviation market. These include the general trend towards the consolidation of regional airports, and the possibility that future aircraft types will not be compatible with PCA's runway.

6. Conclusion

6.1 This study has been undertaken to fulfil a government commitment made at the 2015 Budget to undertake a study into whether previous reports identify viable options for the reopening of Plymouth City Airport.

6.2 This literature review has sought to meet this commitment by assessing whether there is viable demand for commercial passenger services at PCA and whether an airport operator would have the means to provide the service required to meet this level of demand.

6.3 There appears to be a general consensus amongst the reports assessed in this study that demand for commercial passenger services at a reopened PCA will be limited to around 100,000 terminal passengers in the short term, increasing to peaks of over 150,000 terminal passengers in the longer term.

6.4 Whilst there is contention between reports as to whether or not this constitutes a financially sustainable level of demand for commercial passenger services, none of the reports reviewed has presented a case in which scheduled commercial passenger services are commercially viable in the first few years of operation. No report forecasts passenger numbers to exceed previous peaks at PCA, which historic financial performance and the experience of other small airports suggests a *"high risk environment"* in which to operate.

6.5 The financial vulnerability of a reopened PCA is further compounded by supply constraints imposed by the runway, and the dependence on forms of aviation other than commercial passenger services returning to a reopened PCA, in particular Royal Navy Flag Officer Sea Training.

6.6 Reports which have provided a detailed assessment of the runway at PCA suggest that many of the 50 seat turboprops which would be most suitable for any future airline operator at the airport would either be range or payload restricted due to constraints posed by the requirement to meet minimum RESA dimensions imposed by the CAA. The effects of this constraint could be partially relieved by extending the runway to 1,199m, but this would further increase capital costs.

6.7 Therefore, this study has found that the literature does not present a viable option for the reopening of Plymouth City Airport, without a number of commercial risks to any future operator of the airport and any commercial passenger airlines serving the airport. These risks include:

- Passenger numbers falling short of expectations after commercial passenger services are resumed at the airport, or passenger numbers meeting expectations but with lower revenues or higher operating costs than forecast.
- Desired aircraft fleet not being able to operate on PCA's runway without notable restrictions on payload, passenger uplift or range.

- Forms of aviation other than commercial passenger services not returning to the airport, in particular Royal Navy Flag Officer Sea Training, which would result in the loss of a previously significant source of revenue.

6.8 When reviewing any business case which considers resuming commercial passenger services at PCA, the extent to which the proposal provides sufficient evidence that the effects of these risks can be mitigated should be considered. It is not within the scope of this study to determine whether any existing business cases achieve this.

6.9 This study's conclusions are based only on the findings of the existing reports. Decisions about whether or not to reopen PCA for aviation purposes are ultimately ones for private business investors to make, and will be dependent on the viability of specific business plans.

Glossary

ACI	Airports Council International : Trade representative organisation for the world's airports.
Airspace	The air available to aircraft to fly in, especially the part subject to the jurisdiction of a particular country.
APD	Air Passenger Duty. A tax charged on all passengers departing from UK airports
ASDA	Accelerate Stop Distance Available
ATC	Air Traffic Control
ATM	Air Transport Movements. Landings or take-offs of aircraft engaged in the transport of passengers or freight on commercial terms
BA	British Airways
BS 4142:2014	Report on Methods for rating and assessing industrial and commercial sound
CAA	Civil Aviation Authority. The UK's independent aviation regulator, responsible for safety and economic regulation of British aviation, as well as consumer protection in commercial aviation.
CAP 1188	General Aviation Policy Framework, CAA
CAP 168	Licensing of Aerodromes, CAA
CAP 725	Airspace Change Progress Guidance Document, CAA
Capex	Capital expenditure
CAT I	ICAO ILS category with a Runway Visual Range of at least 1,800 feet, and Decision Height of greater than 200ft
CAT II	ICAO ILS category with a Runway Visual Range of at least 1,200 feet, and Decision Height of between 200ft and 100ft
DME	Distance Measuring Equipment. Transponder-based radio navigation equipment used in aircraft
EASA	European Aviation Safety Agency
EGNOS	European Geostationary Navigation Overlay System
EMAS	Engineered Material Arresting Systems
FlyPlymouth/Viable	Formerly known as Viable, FlyPlymouth are a social enterprise who aspire to reopen PCA.
FOST	Flag Officer Sea Training - Royal Navy training organisation responsible for preparing and certifying crews and vessels for service through exercises and readiness inspections.
GVA	Gross Value Added
Hub airports	An airport at which airlines operate flights to maximise the ability for passengers to connect between flights.
ICAO	International Civil Aviation Organisation
ILS	Instrument Landing System
LAeq	LAeq is the noise measure used to describe the average sound level experienced over a period of time resulting in a single decibel value.

Latent demand	Demand for a product that cannot be satisfied due to a lack of supply
LDA	Landing distance available
Load factor	The maximum weight an aircraft can carry, relative to its maximum take-off or landing weight.
LOAEL	Lowest observed adverse effect level. In this report, this refers to the level of noise exposure at which adverse effects on health and quality of life occur
Low cost carrier	Low-cost carriers apply a business model that relies on reducing operating costs (for example, by using dense economy-only seating, not providing free in-flight meals, facilitating connections to other flights, discouraging carriage of hold baggage) to provide passengers with relatively cheap tickets. The model has so far been very successful on short haul routes
mppa	million passengers per annum
OAG	OAG Aviation Worldwide Ltd : an air travel intelligence company that provides comprehensive digital information and applications to the world's airlines, airports, government agencies and travel-related service companies.
Passenger uplift	The number of passengers on an aircraft as a proportion of the total seating capacity of the aircraft.
Payload	The maximum weight an aircraft can carry.
PCA	Plymouth City Airport.
PCC	Plymouth City Council
Point-to-point passengers	Passengers travelling directly from their origin to their destination, without changing services at an intermediate point / hub.
PSO	Public Service Obligation. Regulation (EC) 1008/2008 on common rules for the operation of air services in the Community allows EU Member State governments to establish PSOs on air routes which are deemed vital for the economic development of the region they serve.
RACF	Regional Air Connectivity Fund – a central fund initiated by the Coalition Government in 2013 to establish PSOs to protect existing domestic air routes to London airports; as well as, later, to provide start-up aid for new air routes from smaller airports.
Range	The maximum distance, in nautical miles, that an aircraft can travel after departing from a runway.
Regional jet aircraft	A short to medium-haul, single-aisle commercial airliner typically seating between 50-100 passengers, although some have greater passenger-carrying capacity. They are usually powered by two turbofan engines.
RESA	Runway End Safety Area. Defined in CAP 168 as *"an area symmetrical about the extended runway centreline and adjacent to the end of the strip primarily intended to reduce the risk of damage to an aeroplane undershooting or overrunning the runway".*
SHH	Sutton Harbour Holdings

SOAEL	Significant observed adverse effect level. In this report, this refers to the level of noise exposure at which significant adverse effects on health and quality of life occur.
TODA	Take-off distance available
TORA	Take-off run available
Turboprop aircraft	A commercial aircraft powered by one or more jet turbine engines that drive a rotating shaft, which in turn drives a reduction gear, which ultimately drives a propeller to provide forward thrust.
Virtual airline	An airline that has outsourced numerous operational and business functions. Also used to describe companies that market themselves as airlines, but are unlicensed and undertake flights with licensed operators, often in the livery of the virtual airline.

Annex A: Summary of reports submitted for the study

Plymouth City Airport Runway Length Requirements

Date Published: November 2007
Commissioned by: Plymouth City Council
Authored by: Mott Macdonald
Relevance: Within scope of study

Summary: This report considers the runway requirements of regional aircraft types that could potentially operate in PCA. Mott Macdonald conclude that a 1,199m long runway would only offer small operational benefits and that it is vital to offer a minimum of 1,319m for take-off and a similar distance for landing. The report concludes that without this, the airport would remain unsuitable for economic operations by a wide range of regional aircraft types and would be unable to facilitate services by most existing regional operators within the UK and the near part of Europe.

Assessment of Relevance: This report is deemed to be within the scope of the study as it directly considers the supply constraints of a limited length runway, and what the implications of this are for the type of aircraft that can operate on the runway.

The report is referenced in DfT's study as 'PCC's runway report'.

Project PCA- Limited scope due diligence report

Date Published: July 2011
Commissioned by: Plymouth City Council
Authored by: Grant Thornton International Ltd
Relevance: Not within scope of study

Summary: This report has not been seen by the reviewers. The commissioners of the report, PCC, advise that it relates mainly to the former sale of airport land.

Assessment of Relevance: This report is deemed to be out of scope. The report has not been provided to the reviewers as it contains financially sensitive information. From the description given by PCC, it does not appear to contain information on the viability of operating commercial services from PCA.

This report is referenced in DfT's study as 'PCC's due diligence report'.

Economic Study into Air Services for Plymouth

Date Published: August 2011
Commissioned by: Plymouth City Council
Authored by: Berkeley Hanover Consulting Ltd
Relevance: Within scope of study

Summary: The report has a wide scope, addressing operational constraints, demand for PCA's services, local economic impacts, and the financial risks and implications of various options for PCA.

In terms of operational constraints, the report states that the length of PCA's runway is its main supply constraint and that it would not be possible to extend the runway at a reasonable cost. It concludes that only a small number of turboprop aircraft could operate with their full payload range from PCA, with the largest turboprop previously operating at the airport (Dash 8-Q300 with 50 seats) being unable to carry a full load of passengers much further than Glasgow.

The financial risks and implications of five options are discussed, which range from maintaining services (at the time of publication) to closing the airport. The report finds that there is a high risk that an airport operator would require a subsidy of £1,000,000 per year if operations were continued as *"present"* (as of 2010). The report further finds that there is a reduced financial risk if the airport operator reduces the scale of PCA's operations to 19 seat aircraft and maintains its military activity, as this would mean the airport would be cost covering. Nevertheless, Berkeley Hanover express doubt on the extent to which a new airport operator would be willing to accept the financial risk of this option.

The report considers historic trends in passenger numbers at PCA and its performance relative to other airports in the South West, noting that PCA's share of air passengers in the south west declined substantially between 1995 and 2010. The report also assesses Plymouth's connectivity in the absence of commercial passenger services being operated from PCA, concluding that this is not significantly reduced.

Assessment of Relevance: This report is deemed to be within the scope of the study. Of particular relevance are the chapters referring to the operational constraints of a reopened runway (chapter 3) and the financial risks to airport/airline operators of options for PCA (chapter 8), as these are both fundamental factors in understanding the ability and willingness for airport operators to resume commercial passenger services at PCA. The report also notes important trends in demand for services from PCA.

The report is referenced in DfT's study as 'PCC's economic report'.

Commercial Options for Plymouth City Airport

Date Published: August 2011
Commissioned by: Plymouth City Council
Authored by: Oriens Advisors Ltd
Relevance: Within scope of study

Summary: Prior to the closure of PCA, but after the loss of the Gatwick route, Oriens were commissioned by PCC to provide advice on two key issues: whether any airlines would be willing to immediately establish a network of air services sufficient to make PCA commercially sustainable, and whether any potential airport operators would be able to quickly take over the running of PCA.

To assess the first issue, the report considers the types of aircraft that could be operated from PCA's runway, and whether any of the owners of these aircraft had business models compatible with Plymouth's catchment area. Although a range of airlines with appropriate aircraft are identified, none are deemed to be in a position to make firm commitments to the provision of services on viable terms in short enough timescales (at the time the report was published). Given the lack of reliable airline operators, Oriens also deem that it is unlikely that an airport operator would be willing to invest in PCA, as a critical mass of passengers could not be reached.

Oriens conclude that there is no evidence, as of 2011, of a commercially viable future for PCA that could be established in the short term without some form of subsidy to enable long term planning.

Assessment of Relevance: This report is deemed to be within the scope of the study. Although the report was explicitly limited to considering short term options, the issues considered are still relevant for longer term assessments of PCA's viability.

The report is referenced in DfT's study as 'PCC's commercial options report'.

An Economic Impact Assessment of Plymouth City Airport

Date Published: February 2014
Commissioned by: Viable
Authored by: York Aviation
Relevance: Within scope of study

Summary: York Aviation provide an economic impact assessment of reopening the former airport site based on Viable's Business Plan. Using market capture analysis, York Aviation undertake an assessment of passenger demand in Plymouth and find that between 70,000-150,000 passengers could be achievable at a reopened PCA. York Aviation use regression analysis of comparator airports to consider the direct, indirect and induced economic impact

of this level of passenger demand. York Aviation conclude that this could provide £10m to £17m, and 145 to 250 jobs, to the city annually. The wider economic impacts are examined by York Aviation through consultation with important businesses and economic stakeholders. They conclude that a lack of local air services is adversely impacting the growth of some firms, inward investment and the support of research and medical sectors.

Assessment of Relevance: This report is deemed to be within the scope of the study. Although York Aviation explicitly rule out the potential for airport viability as being within the scope of their study, the passenger projections provide an insight into the level of potential demand that York Aviation believe PCA can achieve. Furthermore, the assumptions made on supply constraints in these projections reflect York Aviation's considerations on the extent to which PCA is constrained by technical, operational and regulatory factors.

The report is referenced in DfT's study as 'Viable's economic impact assessment'.

Air Services for Plymouth - A Summary

Date Published: March 2014
Commissioned by: Sutton Harbour Holdings
Authored by: Fjøri Ltd and Bickerdike Allen Partners
Relevance: Not within scope of study

Summary: Fjøri and Bickerdike Allen provide a brief five page summary on resuming commercial passenger air services at PCA. The summary report concludes that:

- the runway at PCA had the shortest declared length of any principal UK regional airport, and was constrained to 1,199m due to surrounding residential and business premises. Meeting mandatory CAA RESA requirements would further compound this;
- passenger levels were *"unsustainably low"* at PCA, with only 157,933 passengers in 2009 and 128,603 passengers in 2010, only 48,859 of which were revenue generating departing passengers;
- use of passenger jets, such as the Embraer 170 and 190 in Phase 3 of Viable's proposal, would require a careful review of risks, due to the increased area of destruction in the event of an overrun or undershoot, which is likely to include a primary school. The report also points to the noise implications of passenger jets discussed in SHH's noise report;
- considerable funding would be required to cover start-up costs and provide commercially viable air services. However, public subsidies are not available through local or central Government;
- since the closure of PCA, Flag Officer Sea Training (FOST) activities have been re-established within the HMS Raleigh site at Torpoint, and a helipad for use by air ambulance, coastguard and military aircraft is being built at Derriford Hospital; and
- connectivity in Devon is *"good"* despite the closure of PCA. Plymouth is connected to the wider UK and Europe through road and rail links, as well as Exeter Airport. A greater level of engagement is needed with Exeter Airport, which has better infrastructure, longer runways and critical mass, reducing airlines investment risk.

Furthermore, other cities successfully rely on sharing airports with neighbouring cities.

Assessment of Relevance: This report is deemed not to be within the scope of the study. Whilst providing a useful overview of the authors' key arguments against resuming commercial passenger air services at PCA, the summary report does not discuss any relevant topics that other reports commissioned by SHH, included in DfT's study, haven't assessed more rigorously.

Former Plymouth City Airport Site: Independent Aviation Study – Technical Evidence

Date Published: March 2014
Commissioned by: Sutton Harbour Holdings
Authored by: Fjøri Ltd
Relevance: Within scope of study

Summary: Fjøri provide independent advice for SHH on the following aspects, related to resuming aviation activity at the former PCA site:

- **Technical and Operational Review:** Fjøri determine that previous historical dispensations at PCA would need to be addressed in order to gain a new aerodrome license. Most pertinently, this includes increasing the length of the RESA at runway 13. Fjøri then explore the impact on runway capability of a range of options, which could be undertaken to meet licensing requirements.
- **Benchmarking against similar airports:** Fjøri review the regional aviation market and airports of a similar size to PCA to evaluate the historical performance of PCA. Fjøri find that PCA has the lowest Take-Off Run Available (TORA) and the second lowest runway strength compared to other comparator UK regional airports. Fjøri conclude that a reopened PCA would not be able to achieve the minimum TORA length required to make a serious entry into the low cost airline market.
- **Passenger Demand:** Fjøri discuss a number of previously undertaken demand forecasts. Some of these, such as Airport Council International's (ACI's) global forecasts and Eurocontrol's seven-year forecasts, only consider air movements at a very aggregated level. These find that European air traffic is expected to grow slowly relative to the rest of the world. They also assess DfT's forecasts of the UK aviation market, concluding that the South West will experience the second slowest growth in origin / destination passenger journeys.
- **Airline Operator Demand:** Fjøri consider whether there would be demand from airline operators for a reopened PCA, with reference to their earlier assessment of runway capability and PCC's commercial options report. Fjøri conclude that, of the 18 airlines analysed, only CityWing (a virtual airline) is considered to be a *"potential"* candidate, indicating a 50:50 chance of the airline operating routes from a reopened PCA. Fjøri further consider demand at a reopened PCA for aviation activity other than commercial passenger services, concluding that General Aviation would not provide a sufficient revenue stream in and of itself.

Assessment of Relevance: This report is deemed to be within the scope of the study. The Technical and Operational Review directly addresses the supply constraints that a reopened PCA would face, and the viability of actions that could be undertaken to mitigate these constraints. The assessment of airline operator demand helps indicate the likelihood of an airline or airport operator investing at a reopened PCA. Although not providing any new forecasts of passenger demand, the report provides a useful assessment of existing forecasts.

The report is referenced in DfT's study as 'SHH's technical report'.

Former Plymouth Airport Site: Airport Re-opening Feasibility Noise Issues

Date Published: March 2014
Commissioned by: Sutton Harbour Holdings
Authored by: Bickerdike Allen Partners
Relevance: Within scope of study

Summary: Bickerdike Allen initially measure national, local and site specific noise policy, providing a backdrop against which the noise impacts of a reopened PCA are assessed. This includes the Aviation Policy Framework published by DfT in March 2013, which advises the levels of daytime noise at which the onset of significant community annoyance, moderate levels of annoyance and high levels of annoyance are met, and the cost requirements for each of these. The noise level at which night-time flights will disturb sleep are obtained from CAP 725.[37] An assessment of the noise impact of Viable's three phase proposal to reopening PCA is then undertaken. Bickerdike Allen conclude that, by Phase 3, financial assistance towards acoustic insulation would need to be provided to a primary school and around 1,000 people in 450 dwellings. Moreover, around 100 people in 45 dwellings would require assistance with the cost of moving. The impact of non-airborne noise is also assessed. Bickerdike Allen conclude that the existing noise boundary restrictions are *"extremely onerous"* and *"unworkable for a commercial airport"*, and the addition of further restrictions would mean that a future airport operator would be *"hard pressed to meet them"*.

Assessment of Relevance: This report is deemed within the scope of the study as noise restrictions are a form of supply constraint. Noise restrictions have the potential to prevent certain types of aircraft from operating at the airport, reduce the frequency of aviation activity, restrict the times of day at which aviation activities can take place, and reduce the financial viability of an airport through noise compensation requirements.

The report is referenced in DfT's study as 'SHH's noise report'.

[37] The CAA's Civil Aviation Publication (CAP) 725, 'Airspace Change Process Guidance Document', [http://publicapps.caa.co.uk/docs/33/CAP%20725%20update%20March%202016%20amend.pdf]

Plymouth Airport Study: Final Report

Date Published: September 2014
Commissioned by: Plymouth City Council
Authored by: Ove Arup and Partners Ltd
Relevance: Within scope of study

Summary: Using six supporting documents as their evidence base, Arup assess seven aviation options and one non-aviation option for the future of the former PCA site. The aviation options range from reopening the airport with an extended Code 3C runway to reopening PCA as an unlicensed aerodrome. The non-aviation option involves PCC selling the airport land for alternate use.

Arup outline that the objectives for the PCA site are to create a financially viable airport or airfield and to create a gateway for the city. Using an assessment matrix, the aviation options are discussed and then numerically scored against the sub-categories listed in Table A1.

Table A1 Arup's PCA Objective sub categories

Financial Viability		**Wider Benefits**
Cost vs. Returns	***Feasibility***	***Wider Economic Benefits***
Leasehold Acquisition	Presence of a willing seller	City reputation and ease of access
Land Acquisition	Civil Aviation Authority Compliance	Job Creation
Infrastructure	Connections	Inward Investment
Operational	Forecast Demand	Indigenous Investment
Revenue	Retention of Airline Operator	

Source: Ove Arup, *Plymouth Airport Study Final Report*, 21.

Following their assessment, Arup conclude that options involving reopening the airport with commercial services are not currently viable, given insufficient demonstrable market demand, amongst other significant barriers, such as infrastructure costs. Arup conclude that *"a route to future operation of the airport as a licensed airfield (General Aviation) could be developed"*. Arup advocate safeguarding the site whilst a business plan for this option is developed, which would need to demonstrate that the infrastructure and operational costs could be funded, as well as proof of long term viability. Arup stress that *"the permanent loss of the PCA site to aviation use would most likely mean the permanent loss of the ability to reinstate aviation links form Plymouth to the rest of the UK and Europe"*.

Assessment of Relevance: This report is deemed to be within the scope of the study. The sub-categories assessed in the report, and its appendices, include supply constraints at PCA (leasehold acquisition, land acquisition, infrastructure), the presence of viable demand for commercial passenger flights at a reopened PCA (discussion of historic and forecasted demand), as well as the impact of these on the investment potential of a reopened PCA. Appendices B and J (Arup Infrastructure Report and supplementary paper) and Appendix C (Aviation Economics Demand Forecast) provide a more detailed analysis of the infrastructure costs of each aviation option and forecasted commercial passenger demand

for a reopened PCA. Therefore, the findings and conclusions of these appendices will be considered in their own right, as well as how these are interpreted in Arup's assessment matrix.

The report is referenced in DfT's study as 'PCC's September 2014 report'.

Plymouth Airport as a GA Facility – Business Case Assessment

Date Published: March 2015
Commissioned by: Sutton Harbour Holdings
Authored by: Steer Davies Gleave, with Fjøri Ltd
Relevance: Not within scope of study

Summary: SDG/Fjøri's report provides an independent review of reopening PCA for General Aviation (GA) operations only. The authors question the extent to which a reopened PCA could attract sufficient levels of General Aviation, due to former users having already found alternative aerodromes, the poor alignment of the runway and the general decline of the General Aviation market. A business case assessment is undertaken, based on historical data at the airport and "realistic assumptions" on the development of aircraft movement. The report concludes that the airport would not achieve an annual profit in a 20 year timeframe, generating an annual loss approaching £1,000,000.

Assessment of scope: This report is deemed not to be within the scope of DfT's study. The report's scope is to provide an independent assessment of the business case for the reopening of PCA as an aerodrome for General Aviation use only. The commercial viability of reopening PCA as a General Aviation only airfield is not considered within scope for DfT's study. General Aviation activities are only considered in DfT's study where they are explicitly presented in the reports as a means of concurrently supporting scheduled commercial passenger services through the additional revenue stream they provide.

Redevelopment of the Former Plymouth City Airport Site- Assessment of Socio-Economic Benefits

Date published: October 2015
Commissioned by: Sutton Harbour Holdings
Authored by: Regeneris Consulting Ltd
Relevance: Not within scope of study

Summary: This report estimates the socio-economic benefits that would be experienced under the 2015 Leslie Jones masterplan for the PCA site (consisting of 1,600 new homes alongside various non-residential properties). Benefits are expected to accrue on a temporary basis from construction requirements, and a permanent basis through commercial employment and additional resident spending.

Assessment of Relevance: This report is deemed not to be within the scope of DfT's study as it does not consider the viability of using the PCA site to provide commercial passenger services, instead assessing the potential benefits of alternate uses of the site.

FlyPlymouth: Social Enterprise Development

Date published: November 2015
Commissioned by: FlyPlymouth
Authored by: Iridescent Ideas CIC
Relevance: Not within scope of study

Summary: This report considers the various governance structures that could help FlyPlymouth to operate as a social enterprise. To inform the report, a survey of FlyPlymouth's supporters was undertaken, which assessed *"how their supporters feel about the options [FlyPlymouth] are currently considering"* and *"supporters' views about how the airport could benefit Plymouth"*.

Assessment of Relevance: This report is deemed not to be within the scope of DfT's study. The primary function of the report is to consider governance structures available to FlyPlymouth, which does not have a direct impact on the feasibility of operating commercial services from PCA. A survey was carried out for this report, and was targeted at FlyPlymouth supporters and provides anecdotal evidence of demand for an airport in Plymouth. However, as those who support FlyPlymouth are not representative of the Plymouth population, this cannot be used to assess whether or not sufficient demand for an airport exists.

Sea-level rise impacts on transport infrastructure: The notorious case of the coastal railway line at Dawlish, England

Date published: February 2016
Commissioned by: N/A (FlyPlymouth suggested inclusion in DfT study)
Authored by: David Dawson, Jon Shaw, and W. Roland Gehrels
Relevance: Not within scope of study

Summary: This paper considers the potential impact of long-term sea-level rise on the functioning of the costal railway line at Dawlish. Using a *"semi-empirical"* approach, the number of Days with Line Restrictions (DLRs), along with other measures of disruption, are estimated to 2100. Under a *"Medium emissions"* scenario, the authors estimate DLRs will increase by 266% in 2040 relative to 2010 levels. The cost impact of this disruption is also considered, with the cost of railway diversion and extreme events expected to far outweigh the increased costs of maintenance and line restrictions.

Assessment of Relevance: This report is deemed not to be within the scope of DfT's study. Although the reliability of alternate transport routes in the South West will have a marginal impact on passenger demand for air services, there is no explicit consideration of Plymouth Airport in the paper. A balanced surface access assessment could only be conducted

through a thorough consideration of all possible road and rail developments, which would require a far larger programme of work.

A review of the Case for the Safeguarding of the Former Plymouth Airport Site for Future Aviation Uses

Date published: December 2015
Commissioned by: Sutton Harbour Holdings
Authored by: Bickerdike Allen Partners, Steer Davies Gleave Ltd and Fjøri Ltd
Relevance: Within scope of study

Summary: The report is a technical response to the Plymouth Plan Part Two, as part of a consultation phase, specifically addressing the proposal to safeguard the land at PCA for future aviation use in the North Toolkit.[38] The authors separately analyse the viability of commercial services at PCA and General Aviation at PCA. The authors also discuss changes in regulatory policy, the extent to which connectivity is improved by the decision to safeguard the former PCA site and noise impacts of a reopened PCA, which provides a follow up on policy relating to noise analysis undertaken in SHH's noise report.

The report concludes that there is *"no realistic prospect of a commercial air service operating profitably at a re-opened Plymouth airport without significant subsidy"* and that there is *"no prospect of the FAS [Former Airport Site] operating as a viable GA [General Aviation] airport even in the long term"*.

Assessment of Relevance: This report is considered within the scope of DfT's study, as it assesses the viability of commercial services at a reopened PCA.

The report is referenced in DfT's study as 'SHH's review of the case for safeguarding'.

FlyPlymouth Confidential Business Plan

Date published: March 2016
Commissioned by: FlyPlymouth
Authored by: FlyPlymouth
Relevance: Within scope of study

Summary: FlyPlymouth's business plan proposes reopening the airport in three key stages:

- the first stage primarily revolves around providing services and infrastructure equipment required to resume General Aviation at the airport;

[38] http://www.plymouth.gov.uk/north_toolkit.pdf (retrieved 18/07/2016)

- the second stage involves recommissioning air traffic control and meteorological services for General Aviation and charter aircraft, as well as providing a base for use by the Royal Navy's FOST; and

- the third and final stage regards recommencing commercial passenger services to domestic destinations in the third year of airport operation.

The business plan covers several aspects relating to the viability of commercial passenger services at a reopened PCA. This includes a demand forecast, passenger break-even analysis and a technical evaluation of runway capability. An assessment of future risks and contingency plans are also considered as part of the business plan.

FlyPlymouth do not assume that their business plan to reopen PCA will be viable without a short term public subsidy. Their business plan includes an initial £4 million Government Loan Investment and the assumption that one or more routes will qualify for support from the Regional Air Connectivity Fund, totalling £5 million over the first three years of commercial passenger services. FlyPlymouth expect the airport to serve just under 100,000 passengers and be profit-making by the fourth year of commercial passenger services.

The business plan submitted to the department is not considered by FlyPlymouth to be the only possible option for the reintroduction of scheduled air services at PCA.

Assessment of Relevance: This report is deemed to be within the scope of DfT's study. It is the business plan of a potential PCA operator, and therefore contains a detailed assessment of PCA's ability to deliver commercial passenger services. Certain information from the report has not been reflected in this literature review due to its commercially sensitive nature. [39]

The report is referenced in DfT's study as 'FlyPlymouth's Business Plan'

[39] Fly Plymouth's Business Plan is not publicly available

Annex B: CAA data tables

Table B1: Terminal and Transit Passengers at PCA

	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Terminal Passengers	124,562	75,707	69,928	105,968	108,898	76,568	78,156	98,918	115,254	96,498	28,834
Transit Passengers	47,346	25,206	19,291	22,653	23,616	23,477	22,499	18,905	42,679	32,105	8,508
Total	**171,908**	**100,913**	**89,219**	**128,621**	**132,514**	**100,045**	**100,655**	**117,823**	**157,933**	**128,603**	**37,342**

Source: CAA Airport Data Table 9, "*Terminal and Transit Passengers*".

Table B2: Domestic Air Passenger Traffic To and From PCA

	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Gatwick	52,428	58,553	57,445	60,922	65,984	68,742	67,780	60,546	57,516	55,816	2,765
Glasgow	6,434	748	341	0	0	0	0	17,176	24,370	23,300	13,559
Manchester	0	0	0	30,019	43,342	26,915	36,835	33,002	24,307	19,765	7,649
Newcastle	2,706	619	590	20,312	26,602	1,725	0	13,348	16,722	15,126	227
Bristol	31,101	14,991	2,584	10,413	12,951	7,951	6,653	9,566	10,686	9,717	2,589
Leeds Bradford	0	0	0	0	0	10,875	2,888	1,609	8,209	9,227	10,864
Jersey	9,444	258	1,253	10,519	17,136	17,925	17,035	14,774	13,434	7,111	3,865
Guernsey	388	0	0	0	0	0	0	0	3,152	4,240	1,406
Newquay	0	0	0	111	4,729	18,432	4,740	189	725	978	176
London City	0	35	0	0	0	0	0	0	0	720	0
Cardiff Wales	0	0	70	1,906	2,727	190	0	0	1	43	0
Edinburgh	1,887	1,836	0	0	0	0	0	0	0	0	100
Aberdeen	286	1,184	3	0	0	0	0	0	0	0	0
Other Domestic Destinations	56	0	0	0	298	239	684	292	299	251	54
Total	**104,730**	**78,224**	**62,286**	**134,202**	**173,769**	**152,994**	**136,615**	**150,502**	**159,421**	**146,294**	**43,254**

Source: CAA Airport Data Table 12.2, "*Domestic Air Passenger Traffic To and From Reporting Airports*".

Annex C: Summary of responses received from interested parties

1. The department provided a draft of the study to interested parties to allow them to undertake factual checks of the study's interpretation of reports' conclusions ahead of the study being made publicly available on the department's website.

2. The interested parties contacted were those who commissioned the reports reviewed in the study: PCC, SHH and FlyPlymouth. PCC confirmed that they were content with the draft reviewed, and did not provide any further amendments. Both SHH and FlyPlymouth provided a detailed commentary of the study, alongside more specific factual corrections.

3. Where it is considered that these comments are a reflection of a misunderstanding of the scope of the study, the scope was further clarified. For example, both SHH and FlyPlymouth disputed reports' conclusions by providing additional evidence not contained in the reports reviewed. As the purpose of the study is to provide an overview of reports' conclusions as presented by their authors, these comments were not considered within scope. This has been further clarified in paragraphs 1.3 and 1.29 in the study.

4. Both SHH and FlyPlymouth queried the treatment of General Aviation in the draft study. The original draft only considered General Aviation in the context of a staged approach toward resuming commercial passenger services.

5. The rationale for this approach was queried by SHH and FlyPlymouth on the basis that the former airport site has been safeguarded on an "explicit General Aviation basis" in the draft Plymouth Plan.

6. The implementation of this approach was also criticised by SHH and FlyPlymouth. SHH queried the exclusion of the report "Plymouth Airport as a GA facility – Business Case Assessment". In particular, they highlighted areas where the study reflected other reports' findings on the viability of PCA as a General Aviation only airfield as part of a staged approach to reintroducing commercial passenger services.

7. The department recognised that the draft study's approach to General Aviation could be further improved. It is not within scope to consider the viability of General Aviation services resuming at PCA. However, a number of reports discuss the extent to which profitability of a reopened PCA would be impacted by the revenues that Flag Officer Sea Training and other forms of General Aviation could provide alongside commercial passenger services. Therefore, reports' conclusions on the presence of General Aviation are now presented in the study only where these have been discussed in relation to the viability of commercial passenger services.

8. Further comments made in SHH's response:

- SHH highlighted a number of areas where the language of the study may have suggested doubt over reports' conclusions in areas that can be considered "factually correct" and are not disputed by other reports. These comments were primarily in regard to CAA regulations. The department made adjustments to the study to ensure that the language used correctly reflected the extent to which reports' conclusions could be considered non-disputable.

- SHH queried whether the evidence presented in section 2.4.1 supported conclusions on the viability of a Plymouth to London City Airport route in paragraph 6 in the executive summary, and paragraph 2.134 in the main report. The department acknowledged that this conclusion could be further clarified. The conclusions now incorporate studies' discussions of airport charges at London City, and the presence of European and long haul connections at London City Airport.

- SHH stated that paragraph 7 in the executive summary was not consistent with the tables presented in Annex B of the study. The paragraph previously only referred to levels of growth following the financial crisis. It has now been adjusted to reflect that levels of passenger growth achieved across the decade at Bristol was not experienced at PCA.

- SHH corrected a number of areas where they considered SHH's technical report to have been misinterpreted by the department. The department reviewed these comments alongside the technical report, and subsequently made adjustments to paragraph 2.25, regarding the report's discussion of code 2 non-instrument runways, and table 2.5, regarding the description of runway options assessed in the report.

- SHH also highlighted areas where they considered that relevant or important information was excluded from the study. The department reviewed these comments, and subsequently made adjustments where this information was provided by the reports reviewed. The changes made were to paragraph 2.29, which now include Fjøri's comments on the 10% dispensation on declared runway distances at London City Airport, and paragraph 5.34, which now includes Fjøri's statement that Air Southwest "failed to operate successfully from Plymouth". Table 3.2 was also included based on Fjøri's comments, which can be found in PCC's economic report and contains relevant financial data for Air Southwest.

- SHH stated in their response that "it is important to distinguish very clearly between the viability of an airline attempting to run services out of Plymouth and the viability of the airport". The department have made further adjustments to the study to specify where reports are referring to a joint airport / airline operation.

9. Further comments made in FlyPlymouth's response:

    - FlyPlymouth criticised the exclusion of local transport context and economic impact analysis, on the basis they state that this would inform eligibility for an early years' subsidy. However, the purpose of the study is to assess whether resuming commercial passenger services would be commercially viable at a reopened PCA i.e. whether they could resume without an airport or airline subsidy. This has now been clarified in the scope.

    - FlyPlymouth stated that "for factual completeness, the DfT Study should state that the Business Plan submitted is just one approach and may not be the only possible option for reintroduction of schedules air services [in] Plymouth". The department have now specified this in Annex B. The scope further clarifies that options not considered in the reports reviewed are not included in the study (paragraph 1.7).

    - FlyPlymouth highlighted that Viable were not approached by Fjøri regarding their original business plan, which is used in SHH's noise report. FlyPlymouth state that the noise report is therefore a "straw-man exercise based on conjecture under a partial brief". Paragraph 2.102 has been revised to reflect that the accuracy of Bickerdike Allen's interpretation can't be verified, as the department have not had access to Viable's original business plan.

    - FlyPlymouth took issue with the study's discussion of GNSS navigational aids, Engineered Material Arresting Systems, and the likelihood of a 10% dispensation being granted for declared runway distances. In each of these cases, the department contacted the CAA for further clarification, and adjustments have been made to paragraphs 2.17, 2.29 and 2.39.

    - FlyPlymouth also highlighted areas where they considered that relevant or important information was excluded from the study. The department reviewed these comments, and subsequently made adjustments where this information was provided by the reports reviewed. The changes made were to section 2.1.8, which now incorporates Aviation Economics' analysis in Appendix C of PCC's September 2014 report, and section 3.2.4, which clarifies that FlyPlymouth's business plan only forecasts routes to UK airports and Dublin.